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SIMPLE, RAPID DIAGNOSTIC TEST FOR RHEUMATOID ARTHRITIS—BENTONITE FLOCCULATION TEST

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The bentonite flocculation test (BFT) is a modification of a serologic test used to detect Trichinella antibodies. Ingredients for the test are readily available from commercial sources. Stock preparations are stable for months. Equipment necessary for this test is available in the average clinical laboratory. Minimal technical skill is required for performance of the test and reading of results. One hour or less is required from receipt of the serum to completion of the test. Of 114 patients with verified rheumatoid arthritis, the test finding was positive in 85%. Disseminated lupus erythematosus and scleroderma contributed the next highest percentage of positive tests, 55% and 50% respectively. In 58 patients with nonrheumatoid arthritis, the test finding was positive in 3 (5%). The BFT result is positive in about 10% of syphilitic as well as biological false-positive serums.

THE presence of an unusual serum protein capable of reacting with gamma globulin is among the most constant laboratory findings in rheumatoid arthritis. The demonstration of this substance (often referred to as the "rheumatoid factor") by various serologic tests is included in the list of criteria required for the diagnosis of "definite" rheumatoid arthritis proposed by the American Rheumatism Association. It is known that the presence of the rheumatoid factor is closely associated with the finding of subcutaneous nodules, erosion of joint cartilage, and destruction of subchondral bone.[1] Duthie and co-workers [2] found that the presence of the rheumatoid factor seemed to be related to prognosis. In their patients who had positive findings, the disease followed a more severe course than in those with negative findings. In studies of the epidemiology of rheumatoid arthritis in various population groups, the serologic test has been found especially useful and dependable as a diagnostic aid.[3]

Several laboratory procedures are now available for the demonstration of the rheumatoid factor. Despite the importance of serologic testing in diagnosis, prognosis, and epidemiology of rheumatoid arthritis, there are relatively few laboratories in the United States in which these tests are performed.

Among the major deterrents to wider application of these serologic tests have been (1) complex and unstable ingredients, such as sheep erythrocytes

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and rabbit anti-sheep-erythrocyte serum; (2) complex procedures, such as absorption of heterophil agglutinins from human serum, fractionation of serum, and tanning of sheep erythrocytes; (3) time consumption (performance of 20 tests may fully occupy a skilled technician for several days); and (4) difficulties in reading end points of agglutination (this requires considerable experience).

Bentonite Flocculation Test

The bentonite flocculation test (BFT) is a simple, rapid, sensitive procedure for the detection of the rheumatoid factor.[4] Bozicevich and associates,[5] in 1951, described a serologic test with bentonite particles coated with antigenic material from Trichinella used to detect antibodies in the serum of patients infected with Trichinella. The BFT is a modification of this technique, with human gamma globulin used as the coating agent. Ingredients for the test are readily available from commercial

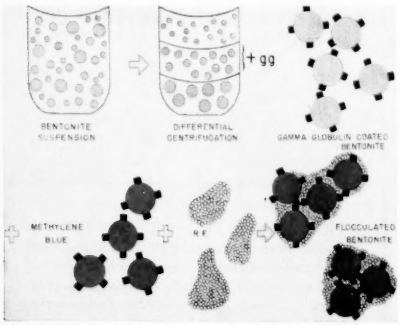

Fig. 1.—Schematic outline of bentonite flocculation test. Bentonite particles are suspended in water and optimum particle size obtained by differential centrifugation. Particles are coated with gamma globulin and dyed with methylene blue. Rheumatoid factor, present in patient's serum, flocculates coated particles.

sources. Stock preparations are stable for months. Equipment necessary for this test is available in the average clinical laboratory. Minimal technical skill is required for performance of the test and reading of results. One hour or less is required from receipt of the serum to completion of the test.

A schematic outline of the BFT is presented in figure 1. Wyoming bentonite, a naturally occurring clay in powder form, is suspended in distilled water. Particles of optimum size for the test are obtained by differential centrifugation. These are coated with pooled normal human gamma globulin. Methylene blue is added to stain the particles and make them readily visible. The coated ("sensitized") bentonite particles are then added to serial, twofold, saline dilutions of inactivated serum on routine serology slides. These slides then are placed on a Boerner type of rotating machine for 20 minutes, and results are observed under a microscope at low-power magnification. Findings on the flocculation test are considered positive when at least 50% of the bentonite particles are clumped into compact masses by a serum diluted 32 times (1:32) or more. In negative results the particles remain freely suspended.

Several thousand tests have been performed in our laboratory. The stock bentonite suspension is stable for six months and the gamma globulin solution for two to three months. Although we prepare freshly coated bentonite particles every week, it has been found that coated particles may be used satisfactorily after three weeks' storage in the refrigerator. Sufficient stock bentonite solution can be prepared at one time to permit the performance of 500 screening tests.

How to Perform the Test

Preparation of Stock Bentonite Suspension.—Detergents (often used in cleaning glassware) adherent to the surface of glassware will interfere with this test. It is important, therefore, to cleanse all glassware of this material by washing with distilled water before using.

Suspend 0.5 Gm. of Wyoming bentonite (BC micron or no. 200 standard Volclay) in 100 ml. of distilled water. Homogenize in Waring blendor for one minute; repeat after five minutes for one minute.

Transfer bentonite suspension to 500 ml. glass-stoppered graduate, and add distilled water to make 500 ml. Shake thoroughly, and allow to settle for one hour. Pour off supernatant into six 100-ml. centrifuge tubes (heavy duty, Pyrex), and centrifuge, by tachometer, at 1,300 rpm for 15 minutes. Use International centrifuge, size 2, with no. 240 head. Pour off and save supernatant; discard sediment.

Centrifuge supernatant in 100-ml. tubes at 1,600 rpm for 15 minutes. Pour off supernatant, and discard it.

Resuspend accumulated sediment from the six tubes in 100-ml. of distilled water, and homogenize in Waring blendor for one minute. This is the stock bentonite suspension, which, in our experience, has remained stable for as long as six months without losing its adsorptive properties.

Preparation of F-2 Solution.—Lyophilized fraction 2 (gamma globulin), 0.5 Gm., derived from pooled normal human serum, is suspended in installments while stirring in 50 ml. of 0.06 M barbital (Veronal) buffer, pH 8.6 (made by dissolving 0.184 Gm. of barbituric acid and 1.03 Gm. of sodium barbiturate in 100 ml. of distilled water). This buffered F-2 suspension may be stored in a refrigerator for one or two months. Before use, it should

be cleared by centrifugation at 3,000 rpm for 10 minutes in order to remove all particulate matter; otherwise, the latter might simulate flocculation.

Preparation of Sensitized Bentonite Particles.—Thoroughly shake the stock bentonite suspension to distribute the bentonite particles evenly. Remove 10 ml. of the uniformly dispersed particles, place in a 15-by-200-mm. culture tube, and centrifuge at 3,000 rpm for five minutes.

Decant the supernatant and add 1 ml. of distilled water to the sediment. Agitate the tube to resuspend the bentonite particles in the 1 ml. of distilled water.

Add 2 ml. of stock F-2 solution and mix gently by tilting and rotating. Allow the suspension to stand from 15 to 30 minutes at room temperature to permit adsorption. Add 15 ml. of distilled water and again mix gently.

Centrifuge for five minutes at 3,000 rpm. Decant the supernatant. Resuspend the sediment with 5 ml. of distilled water, shaking thoroughly. Add another 10 ml. of distilled water, and shake.

Centrifuge as previously. Decant the supernatant, and again resuspend the sediment in 5 ml. of distilled water. Shake vigorously. To this suspension add 1 ml. of 0.1% methylene blue dye; shake, and, after five minutes, add 10 ml. of distilled water and centrifuge.

Decant the supernatant, resuspend the sediment in 10 ml. of distilled water, and centrifuge. Again decant the final washing, and to the sediment add 4 ml. of 0.05 M phosphate buffer, pH 7.3 (made by dissolving 0.975 Gm. of sodium phosphate and 0.185 Gm. of potassium dihydrophosphate in 100 ml. of distilled water). This constitutes the sensitized bentonite particles. Add 0.1 ml. of 1% polysorbate 80 (Tween 80).

Conducting the Test.—The serum to be tested should be inactivated for 30 minutes at 56 C prior to use. Microscopic slides (3 in. by 2 in.) with 12 rings, designed for serologic flocculation tests, are used to conduct the test. In each ring on the slide is placed 0.1 ml. of serial twofold dilutions of serum in phosphate-buffered saline solution at pH 7.4. One drop of sensitized bentonite suspension is added to each ring. (Prior to use, the suspension should be thoroughly shaken.) The drop is of such size that a capillary pipet should dispense about 40 drops per milliliter. The slide is then rotated on a Boerner type of rotating machine at 100 to 120 rpm for 20 minutes and read immediately under a microscope at low-power magnification (60×). Drying is to be avoided.

Reading of Results.—A reaction is regarded as 4+ when all of the sensitized particles are clumped in separate masses. There may be a few large or a number of small clumps, depending on the titer of the serum. Nevertheless, the fields between the flocculi are almost clear. A reaction is regarded as 3+ when approximately three-fourths of the sensitized particles have clumped. A 2+ reaction is one in which half of the particles are clumped and half still remain in colloidal suspension. In a 1+ reaction only one-fourth of the bentonite particles are clumped. In a negative reaction the sensitized bentonite particles are in colloidal suspension. The result of the flocculation test is considered positive when a 2+ or stronger clumping occurs in a serum dilution of 1:32 or higher. Although a negative-reacting serum does not cause any clumping in dilutions up to about 1:1,000, occasionally a 1+ or 2+ flocculation may occur in dilutions of 1:1,000 or higher.

With each test performed, serial saline dilutions of a known positive and a known negative reacting serum should be included in order to detect any change in the sensitized bentonite particles. If debris has gotten into the sensitized bentonite mixture or the control negative reacting serum, false clumping may result. With experience, the spurious aggregates can readily be distinguished from true flocculation. When the result of the test is positive, the flocculi are of uniform density, evenly distributed in the microscopic field, and free of "hyaline-like" material or other debris.

Heating of Serum and Storage Conditions

Necessity for Heating Serum Prior to Testing.—In an attempt to further decrease the time involved in performing the BFT, we studied the need for heating the serum before testing. One hundred tests were simultaneously performed on serum heated to 56 C for 30 minutes and on unheated serum. The effects of heating were found to be significant both in serums with a low titer and in those with moderate and high titers, although the effects were different in these two types. In serum that yielded a positive but low titer (e. g., 1:32 or 1:64) after heating, the reaction was absent; a negative result was obtained when the unheated serums were tested. In some unheated serums with moderate or high titers, again there was no flocculation at all in the first few tubes ("prozone-like" phenomenon), but significant flocculation occurred even in dilutions that extended several tubes beyond the end point obtained when the same serums were tested after heating (table 1). From these observations it is apparent that heating of the serum prior to testing is necessary.

Effect of Serum Storage Conditions on BFT.—The effect of storage of serum under various conditions was also determined. Serum specimens were divided into several aliquots which were then stored at room, refrigerator, and freezer temperatures and tested repeatedly at intervals for six weeks. As indicated in table 2, the titers increased fairly consistently, though slightly, with storage. In rare instances, a negative or "doubtful" result (i. e., 2+ or 3+ flocculation in dilutions of 1:16) obtained with fresh serum became positive after storage

(case 5, table 2). A possible explanation for increase in activity of serum on storage is that the rheumatoid factor which had combined with the patient's own gamma globulin in vivo dissociated on storage, making available more "reactive sites" on the rheumatoid factor. These sites are then exposed to the gamma-globulin-coated bentonite, and flocculation results.

TABLE 1.—*Effect of Heating Serum* on Results of Bentonite Flocculation Test in Two Patients with Rheumatoid Arthritis*

	Case			
	1		2	
Dilution	Heated	Unheated	Heated	Unheated
1:4	++++	—	++++	—
1:8	++++	—	+++	—
1:16	++++	—	+++	—
1:32	++++	+	+++	±
1:64	++++	+++	++	±
1:128	+++	+++	±	+
1:256	+++	+++	—	±
1:512	+++	+++	—	—
1:1,024	++	+++	...	...
1:2,048	+	++	...	...
1:4,096	+	+	...	...

* 56 C for 30 minutes.

Ten serums containing moderate to high titers of rheumatoid factor were stored at −20 C and retested after six months (table 3). Although there was some loss of activity in three of the serums, only one showed negative results. Fourteen with negative findings continued to have negative findings on retesting after storage.

Modifications of the Procedure

Attempts to modify the BFT by simultaneously combining bentonite particles, gamma globulin, and patient's serum on a slide failed to produce a positive reaction. The bentonite particles must be coated prior to their addition to serum.

Occasionally, inactive preparations of pooled human gamma globulin are received. In agreement with the experience of others, it was found that bentonite failed to increase its reactivity. Rheins and co-workers [6] have demonstrated that preparations of gamma globulin from several animal species were suitable "antigens" in the latex-fixation test.

Efforts at a further simplification of the BFT produced a slide screening test of equal or slightly greater sensitivity than the original procedure. This modification consists of the addition of one drop of

TABLE 3.—*Effect of Six Months' Storage at −20 C on Positive Findings*

	Titer After Storage	
Case	1 Wk.	6 Mo.
7	1:8,192	1:8,192
8	1:8,192	1:8,192
9	1:1,024	1:2,048
10	1:1,024	1:1,024
11	1:512	1:512
12	1:256	1:1,024
13	1:128	1:128
14	1:1,024	1:128
15	1:1,024	1:128
16	1:256	Neg.

coated bentonite particles to one drop of undiluted, heated serum on a glass slide. The mixture is stirred thoroughly and flocculation directly observed after five minutes. Microscopic examination is helpful in confirming the gross observations and in differentiating bentonite flocculi from debris. Gamma globulin used as a coating agent in this test is routinely heated to 63 C for 10 minutes; the new method eliminates the need for serial serum dilutions, the Boerner type of rotating machine, and special serologic slides.

Table 4 presents the results of a comparison between the BFT and the screening test modification. One hundred forty-four serums from 36 patients with rheumatoid arthritis and 87 from 61 controls were tested.

A disproportionately large number of serums giving doubtful and also false-positive reactions were selected for this analysis. There was agree-

TABLE 2.—*Effect of Storage on Results of Bentonite Flocculation Test**

		Titers During Storage Time											
		1 Wk.			2 Wk.			4 Wk.			6 Wk.		
Case	Fresh Serum	25 C	5 C	−20 C	25 C	5 C	−20 C	25 C	5 C	−20 C	25 C	5 C	−20 C
3	1:256	1:1,024	1:512	1:256	1:512	1:256	1:256	1:512	1:2,048	1:512	...	1:4,096	1:2,048
4	1:1,024	1:8,192	1:1,024	1:4,096	1:2,048	1:1,024	1:1,024	1:8,192	1:8,192	1:8,192	...	1:2,048	1:4,096
5	Neg.	1:64	1:128	1:512	Neg.	1:128	1:64	1:64	1:64	1:128	...	1:256	1:128
6	1:32	1:128	1:128	1:64	1:64	1:64	1:256	1:32	1:64	1:64	...	1:128	1:128

* Sterile handling of serum was not attempted, and no preservatives were added; in general, there was no gross evidence of bacterial contamination.

solutions of these inactive preparations could be converted into satisfactory coating agents by heating at 63 C for 10 minutes. Attempts to use commercial preparations of bovine and porcine gamma globulin instead of human gamma globulin were unsuccessful. Bentonite particles coated with these preparations reacted weakly, if at all, with known positive rheumatoid serums. Heating the bovine and porcine gamma globulin at 63 C prior to coating

ment of the results obtained by the two tests in 98.2% of serums examined. The BFT doubtful category is considered separately; the result of the screening test was positive in seven and negative in four serums obtained from patients with verified rheumatoid arthritis. In the control series findings in both tests were positive in seven; the screening test detected two additional false-positive results. These two serums were from patients with leu-

kemia. In summary, the result of the BFT was positive in 67% of specially selected cases of rheumatoid arthritis, whereas the slide screening test was positive in 77%. In the controls, a false-positive reaction was obtained in 6% with the BFT and in 10% with the screening test.

Test Results

In order to evaluate the diagnostic usefulness of the bentonite flocculation test only patients whose clinical diagnosis was verified by us were accepted for study. The results of our experience to date with the BFT are presented in table 5. Of 114 patients with verified rheumatoid arthritis, the test finding was positive in 85%. In eight with definite juvenile rheumatoid arthritis there was one positive reaction. This patient has had arthritis since the age of 8 and has active disease at the age of 46. Disseminated lupus erythematosus and scleroderma contributed the next highest percentage of positive tests, 55% and 50% respectively. In 58 patients with nonrheumatoid arthritis, the test finding was positive in 3 (5%).

TABLE 4.—*Comparison of Bentonite Flocculation Test and Screening Modification in Patients with Rheumatoid Arthritis and in Controls*

Test Result	Patients		Controls	
	Total No.	Serums, No.	Total No.	Serums, No.
Positive BFT, positive screening test	23	109	4	7
Positive BFT, negative screening test	1	1	...	...
Negative BFT, positive screening test	1	2	1	1
Negative BFT, negative screening test	5	21	55	78
Doubtful BFT,* positive screening test	4	7	1	1
Doubtful BFT,* negative screening test	1	1	...	...

* Less than 50% of bentonite particles flocculated in serum diluted 1:32.

In our experience, some BFT-negative serums from patients with definite rheumatoid arthritis yielded positive results when the euglobulin fraction of the serum was tested. Euglobulin fractions were prepared by diluting serum in 14 volumes of cold distilled water. After two hours at 5 C, the resulting precipitate was redissolved in buffered saline solution and tested. Six whole serums from patients with rheumatoid arthritis gave negative BFT results; euglobulin preparations from three of these patients were positive in titers of 1:128, 1:256, and 1:512.

Four of 27 patients with leukemia and lymphomas had positive findings (table 5). It is suspected, but not yet proved, that among the abnormal serum proteins produced in these diseases there may be present a macroglobulin which resembles the rheumatoid factor in its ability to react with human gamma globulin. Three of 31 patients with uveitis had positive results. One of these had a brain tumor and macroglobulinemia. The other two patients had no significant history and exhibited no clinical signs or roentgenologic evidence of rheumatoid arthritis.

Among 151 male blood donors in the age group 20 to 45 years were two positive reactors. The incidence of positive reactors among healthy individuals has generally been found to be about 2 to 3%.[7] The BFT result was uniformly negative in 25 normal volunteers.

Variation in BFT Titer.—Although a direct correlation has been found between the full development of rheumatoid arthritis and incidence of positive serologic findings,[1] we have observed in some patients with fully developed rheumatoid arthritis conversion of positive to negative test reactions and the reverse. Repeated bentonite flocculation tests were done at weekly or monthly intervals for periods of four weeks to 10 months in 40 patients with chronically active rheumatoid arthritis. Twenty-six patients had consistently positive results and seven consistently negative results. However, in seven other patients findings were negative and positive at various times. The cause of this inconsistency is unknown; it does not appear to be related to changes in activity of the disease or in the host's response to disease. At any rate, this phe-

TABLE 5.—*Results of Bentonite Flocculation Tests*

Diagnosis	Cases, No.	Positive, No.	Negative, No.
Rheumatoid arthritis			
Adult	114	97(85%)	17
Juvenile	8	1(12%)	7
Collagen disease			
Systemic lupus erythematosus	11	6(55%)	5
Scleroderma	10	5(50%)	5
Dermatomyositis	3	...	3
Nonrheumatoid arthritis			
Rheumatic fever	1	...	1
Rheumatic heart disease (active and inactive)	10	...	10
Gout	24	1	23
Osteoarthritis	13	...	13
Reiter's syndrome	8	1	7
Ankylosing spondylitis (with and without peripheral joint involvement)	5	1	4
Total	61	3(5%)	58
Nonrheumatic disease			
Carcinoma of various organs	45	...	45
Leukemia and lymphoma	27	4	23
Uveitis	31	3	28
Hypercholesteremia	5	...	5
Cirrhosis, alcoholic	5	...	5
Undiagnosed disease	5	...	5
Multiple myeloma	4	...	4
Congenital heart disease	4	...	4
Muscular dystrophy	4	...	4
Osteoporosis	4	...	4
Arteriosclerotic heart disease	4	...	4
Mental defective	3	...	3
Stomatitis	3	...	3
Agammaglobulinemia (with and without arthritis)	3	...	3
Hypothyroidism	3	...	3
Viral infections	3	...	3
Diabetes mellitus	2	...	2
Pseudohermaphroditism	2	...	2
Actinomycosis	2	...	2
Hyperthyroidism	2	...	2
Miscellaneous	31	...	31
Total	192	7(4%)	185
Normal volunteers	25	...	25
Professional blood donors	151	2(1%)	149
Total	176	2(1%)	174
Total controls and normal persons	429	12(3%)	417

nomenon underscores the importance of doing repeated serologic examinations in patients who appear to have rheumatoid arthritis but whose test results are negative on one or more occasions.

Figure 2 illustrates the three types of serial reactions, namely, consistently negative (*top*), intermittently positive and negative (*center*), and consistently positive (*bottom*). All three patients had typical, chronically active rheumatoid arthritis. The disease had been present for 14, 9, and 7 years respectively. Multiple, symmetrical joint involvement and x-ray evidence of cartilage and bone erosion were present. All three patients have received steroid therapy daily, uninterruptedly, for the past four years. There has been sufficient suppression of disease to permit usual activities with minimal to moderate discomfort.

Comparison of Tests and Effect of Other Serum Macroglobulins

Comparison of BFT and Latex-Fixation Tests.—In a previous publication,[7] results obtained by the BFT and sensitized sheep erythrocyte agglutination (SSEA) test done on the same serum samples from 64 patients were compared. There was agreement between results of both tests in 63 samples and disagreement in 1. A similar comparison between the BFT and latex-fixation test was done in this study. The latex-fixation test was carried out according to method of Singer and Plotz.[8] Polystyrene latex particles 0.81 μ in diameter and glycine-buffered saline solutions, pH 8.2, were used.

In 49 patients with rheumatoid arthritis there was agreement of results by both tests in 96% of the serums examined. In two patients with definite rheumatoid arthritis both findings on tests were negative. In the remaining two, the latex-fixation test results were negative and the BFT results positive at titers 1:32 and 1:64. In the nonrheumatoid group, with 58 subjects, again there was agreement between the two tests in 96%. In 55, results of both were negative. In one patient with a definite diagnosis of gout, the results of both tests were persistently positive. Findings in another patient, with syphilis, were negative in the latex-fixation test and positive in the BFT at 1:32. The remaining patient, with cirrhosis, had negative findings in the BFT and positive in the latex-fixation test.

The basic principle of the latex-fixation test and bentonite flocculation test is similar. In both, inert particles are used and pooled human gamma globulin is used to coat or "sensitize" the particles.

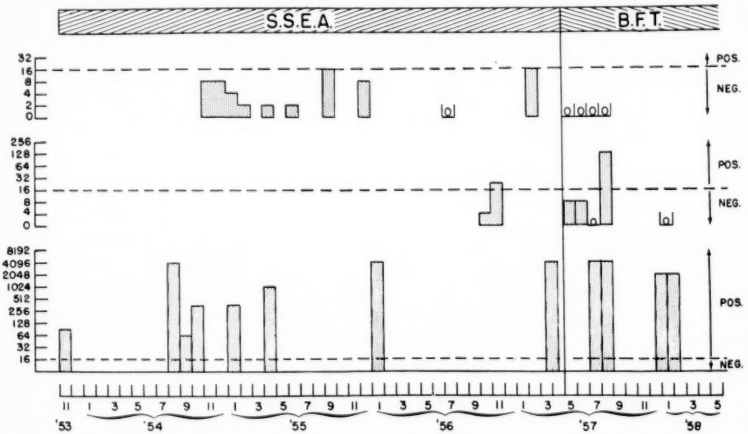

Fig. 2.—Variation in titer of rheumatoid factor in serum of three patients with rheumatoid arthritis: *top*, consistently negative, *center*, intermittently negative and positive, and, *bottom*, consistently positive. (S.S.E.A.=sensitized sheep erythrocyte agglutination test, replaced by BFT in this laboratory in May, 1957.)

Independence of Host Response and BFT.—Although many abnormal laboratory findings in rheumatoid arthritis are restored toward or to normal values after improvement with corticosteroid administration, the positive serologic test for this disease is generally unaltered by therapy. The patient whose case is illustrated in figure 3 was studied during an exacerbation of arthritis induced by reduction in required dosage of steroid. He was a 47-year-old male who had had severe rheumatoid arthritis for eight years. The marked flare of his arthritis was associated with a rise in erythrocyte sedimentation rate and increase in jewelers' ring size (an index of proximal interphalangeal joint swelling). Despite these changes the BFT remained fairly constant; the titer varying by only one tube, 1:256 to 1:512. This case illustrates the dissociation between host response and the serologic reaction.

Effect of Other Serum Macroglobulins on BFT.—Franklin and associates [9] have described the physical properties of the rheumatoid factor as determined by ultracentrifugation. They have demonstrated a protein of unusual, high molecular weight in about one-third of the serum samples from 31 patients with rheumatoid arthritis. This protein appears to be a circulating complex composed of a macroglobulin (the rheumatoid factor) and one or more gamma globulins of low molecular weight. Electrophoretically, this macroglobulin travels with the faster-moving gamma globulins. A number of other serum proteins share these characteristics of high molecular weight (about one million or more) and gamma electrophoretic mo-

of a history or other evidence of infection suggested a biological false-positive reaction, were examined. Two of these samples gave positive BFT findings in titers of 1:1,024 and 1:2,048. Information indicates that these patients do not have rheumatoid arthritis at present. Moore [11] found that the biological false-positive reactions may precede by many years, or occur concurrently with, rheumatoid arthritis, systemic lupus erythematosus, or "collagen vascular disease." In a group of 68 patients who chronically had biological false-positive reactions, eight had rheumatoid arthritis. It will, therefore, be of interest to determine whether the two patients with positive findings in the BFT will eventually develop rheumatoid arthritis.

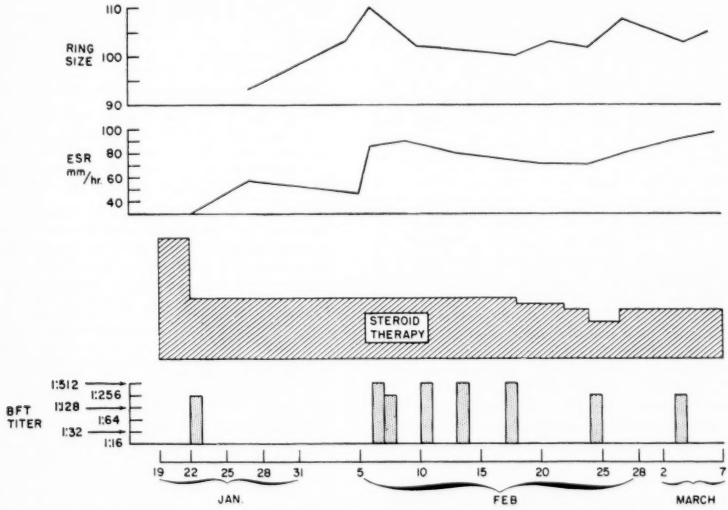

Fig. 3.—Clinical and laboratory recrudescence induced by reduction in steroid dosage (from 30 to 15 mg. of prednisone daily). Effect on swelling of interphalangeal joints (ring size) and erythrocyte sedimentation rate is shown. BFT titer remained independent of patient's clinical condition.

bility. Among these are the macroglobulins responsible for the Wassermann and biological false-positive reactions, some isoagglutinins, the complete Rh agglutinins, cold agglutinins, and macroglobulins and macrocryoglobulins associated with the disease macroglobulinemia of Waldenström.

Rheins and co-workers [10] have reported positive findings in latex-fixation tests in 7 of 24 patients with syphilis. The BFT was performed on serum samples from 25 patients who had positive slide flocculation or complement fixation test findings for syphilis. In two of these patients the BFT results were positive in titers of 1:64.

Serum from 20 patients with positive findings in serologic tests for syphilis, in whom the absence

Eight serum samples that showed low titers of cold agglutinins have been tested. In one of these a borderline positive BFT finding was obtained.

Macroglobulinemia of Waldenström is characterized by hypergammaglobulinemia,[12] and, on ultracentrifugation, serum from such patients reveals a marked increase in proteins with high molecular weight (sedimentation constant of about 19, as well as lesser amounts of even heavier proteins). The BFT was performed on the serum of four such patients. In two patients a titer of 1:8,192 and 1:16,394 was obtained. In the remaining two patients the BFT result on whole serum was negative. Euglobulin fractions prepared from these serums yielded a positive BFT finding in one.

Comment

Serologic testing for rheumatoid factor or factors has been greatly facilitated by the substitution of inert particles for erythrocytes. The substitution of latex or bentonite particles has eliminated the need for absorption of heterophil antibodies and for anti-erythrocyte rabbit serum. Sheep erythrocytes, the most commonly used "carrier" in these tests, vary in behavior at different times of the year and deteriorate on storage. Furthermore, sheep red blood cells coated with rabbit antibody (rabbit gamma globulin) to sheep erythrocytes do not seem to react as sensitively with the rheumatoid factor as cells or particles coated with human gamma globulin. In general, serologic tests with human gamma globulin yield a greater percentage of positive results than do those with rabbit amboceptor.[13] Attempts to use bovine and porcine gamma globulin as coating agents in the BFT were unsuccessful.

In sheep cell agglutination reactions, it is necessary to heat the test serum to 56 C for 30 minutes in order to destroy components of complement and thereby avoid hemolysis. Even in the BFT, in which erythrocytes are not used, it was also necessary to heat the serum. Singer,[14] as well as others, has demonstrated that no fraction of complement plays a role in either sensitized sheep cell or latex-fixation reactions. Heating of serum, however, in addition to inactivating complement, denatures proteins. Electromigration of canine serum was markedly affected by such treatment; serum proteins migrated faster than those in the unheated controls.[15] The existence of a complex composed of rheumatoid factor and the patient's own gamma globulin has been mentioned previously. Rheumatoid factor may be undetectable because it is "bound" to the patient's gamma globulin. Mild heating of the serum may denature gamma globulins or otherwise disrupt the complex and thus make rheumatoid factor available for reactions with the test system.

The BFT result is positive in about 10% of syphilitic as well as biological false-positive serums. Peltier and Christian[16] found a similar incidence of positive results in F-2 coated, tanned sheep cell tests in a large series of syphilitic serum samples. Positive BFT results were obtained in three of four patients with Waldenström's macroglobulinemia. It is noteworthy that in both tests human gamma globulin is employed. These results suggest that one may expect false-positive results in serologic tests for rheumatoid arthritis in diseases in which macroglobulins are produced. It remains to be determined whether the property of reacting with gamma globulin is characteristic of a species of molecules, i. e., macroglobulins, or only of one member of the species, i. e., rheumatoid factor. The occurrence of positive findings in tests for rheumatoid arthritis in a variety of nonarthritic diseases does not detract from the value of the tests as laboratory aids in the differential diagnosis of polyarthritis.

Summary

The bentonite flocculation test and the screening test modification are simple, reliable, and sensitive laboratory aids in the diagnosis of rheumatoid arthritis. Positive test results were obtained in about 85% of verified cases of rheumatoid arthritis. The incidence of false-positive results in 429 controls was 3%. Diseases in which macroglobulins are produced may give 10% or more false-positive results in serologic testing for rheumatoid arthritis.

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BENTONITE FLOCCULATION TEST IN RHEUMATOID ARTHRITIS

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The bentonite flocculation test was applied to the serums of 48 patients who satisfied all the clinical criteria for rheumatoid arthritis. Positive results were obtained in 40 and false-negatives in 8 (17%). Of 12 patients with the probable diagnosis of rheumatoid arthritis, 4 gave positive results, and 8 (67%) gave false negatives. The test was also applied in other rheumatic conditions, with negative results in 17 out of 19 cases of rheumatoid spondylitis and negative results in all of 15 cases of osteoarthritis with fibrositis, indicating that these two conditions differ significantly from rheumatoid arthritis. Applied to 68 other patients with symptoms involving the joints, the test gave negative results in all but four (2 out of 10 patients with gout, 1 out of 4 with lupus erythematosus, and 1 out of 12 with essential hypertension). The bentonite flocculation test is comparatively simple and inexpensive, and these data indicate that it is a useful laboratory aid in the diagnosis of rheumatoid arthritis.

The clinical diagnosis of a disease entity deserves, in most instances, its corroboration by specific laboratory findings. This is especially true when the symptoms and signs of an illness may simulate other conditions. In the field of rheumatic diseases, this is a frequent occurrence. An indication that the proper diagnosis of rheumatoid arthritis in clinical practice is not as simple or as frequently made as is generally believed is demonstrated by the necessity for the development of diagnostic criteria by the American Rheumatism Association.[1] Therefore, a laboratory test which will aid in establishing a diagnosis of rheumatoid arthritis by either corroborating an obvious clinical impression or reassuring a doubtful one is desirable. The test should be accurate, with as few false-positive and negative results as possible; simple, not requiring highly trained personnel to perform it; and inexpensive, so that it can be used without creating an economic burden on the patient or the institution.

Since 1930, when Cecil and co-workers [2] reported on the agglutination of certain strains of streptococci by serum from patients with rheumatoid arthritis, considerable work has been done both in the search for a diagnostic test that will fulfill these criteria and in the identification of the factor or factors responsible for these reactions. In 1940, Waaler [3] demonstrated the capacity of serum from patients with rheumatoid arthritis to agglutinate sensitized red blood cells, and in 1948 Rose and associates [4] stimulated additional interest in the hemagglutination reactions by introducing the differential agglutination test. In 1954 Heller and co-workers [5] detected a substance in human blood fraction 2, the gamma globulin fraction, which had a great affinity for the factor or factors present in the serum of patients with rheumatoid arthritis, paving the way for the development of simpler serologic tests. With use of some other particulate matter and fraction 2 as the sensitizing substance, the necessity for either absorbing the heterophylic antibodies or having to perform differential hemagglutination tests, both of which are intricate and time consuming, was obviated. Work toward this end was initiated by Plotz and Singer [6] when they introduced the use of polystyrene latex particles. The accuracy and relative simplicity of this test have been recently corroborated by Rothermich and Philips.[7]

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At the Ninth International Congress on Rheumatic Diseases at Toronto, Canada, in June, 1957, Bozicevich and associates [8] reported on the use of bentonite particles in a flocculation test for rheumatoid arthritis. This test appeared to be equally accurate, as simple to perform, and a more economical procedure than the tests previously devised. These reports stimulated us to investigate the bentonite flocculation test for use in our patients.

Methods

The bentonite flocculation test was performed as described by Bozicevich and associates.[9] A suspension of bentonite particles of a specific size, those obtained by centrifugation at 1,300 to 1,600 rpm, will not tend to flocculate spontaneously and will be active for several months when kept at room temperature. A solution of fraction 2, derived from pooled human serum and prepared by dissolving 0.5 Gm. of the dried gamma globulin in 50 ml. of barbital (Veronal) buffer, will maintain its potency for one to two months when stored at 5 C. Sensitization of the bentonite particles is performed as described by Bozicevich and associates.[9] These sensi-

tized particles remain active for an average of one week when stored in the refrigerator, as demonstrated in table 1. This obviates the need for a fresh preparation every time the test is to be performed.

When an immediate test was not required, it was convenient to store the serum in a frozen state, until two or more tests could be performed at the same time, without variation in results (table 2).

TABLE 1.—*Activity, in Titer of Serum Reaction, of Sensitized Bentonite Particles After Storage*

Case	Storage Period		
	Control	1 Wk.	2 Wk.
1	1:512	1:512	1:4
2	1:512	1:512	1:8
3	1:128	1:256	1:2
4	1:256	1:256	1:8

This experience confirms previous reports [10] that the rheumatoid factor is not altered by storage of the serum in a frozen state. The initial test on these patients was performed on the day of collection, while the retesting was done at varying intervals of time. Titers in both instances were identical, although in some instances there were minor differences in the reaction.

Results

Rheumatoid Arthritis.—The serum of 60 patients with rheumatoid arthritis was tested. The diagnosis was established according to the criteria of the American Rheumatism Association,[1] prior to the performance of the serologic test, and confirmed as such by one of us (R. T. S.). The results are summarized in table 3, along with those for other conditions. Forty-eight of these patients had definite rheumatoid arthritis; 40 (83%) gave positive results in the flocculation test. Twelve patients were classified as probably having rheumatoid arthritis, with 4 (33%) exhibiting positive results.

TABLE 2.—*Reaction of Serum After Storage*

Case	Date of Test	Titer
5	11/13/57	1:1,024
	3/ 7/58	1:1,024
6	12/12/57	1:2,048
	3/17/58	1:2,048
7	12/16/57	1:512
	1/1/58	1:512
8	12/16/57	1:1,024
	1/13/58	1:1,024
9	12/20/57	1:256
	3/ 7/58	1:256

The duration of illness in both groups was similar, ranging from six months to 30 years. Two patients with rheumatoid arthritis also had gout. The diagnoses of both types of arthritis were established several years prior to the test. In each instance there was a strongly positive serologic reaction.

Sixteen patients with rheumatoid arthritis had negative findings in the bentonite flocculation test. This group deserves further comment. Seven of these patients had definite clinical rheumatoid arthritis; therefore, their reactions are truly false-negative. The remaining nine individuals were classified as probably having rheumatoid arthritis. Two of this latter group had articular involvement limited to the knee joints. A 49-year-old man has had recurrent inflammatory changes in both knees during the past nine years. A synovectomy on the right knee was performed several years ago, with a pathological diagnosis of chronic synovitis. A 37-year-old man had poliomyelitis during adolescence, with neurological residuals involving the right upper and lower extremities. For the past five years he has had recurrent inflammatory joint disease, involving both knees.

TABLE 3.—*Findings on Bentonite Flocculation Test in Patients with Rheumatoid Arthritis, Other Rheumatic Conditions, and Other Illnesses*

Diagnosis	Patients Tested, No.	Reactions, No.	
		Positive	Negative
Rheumatoid arthritis			
Definite	48*	40* (83%)	8
Probable	12	4 (33%)	8
Total	60	44 (73%)	16
Rheumatoid spondylitis	19	2‡ (11%)	17
Other rheumatic conditions			
Scleroderma	3	...	3
Systemic lupus erythematosus	4	1	3
Osteoarthritis and fibrositis	15	...	15
Gout	10*	2*	8
Allergic vasculitis and arthritis	1	...	1
Postcommissurotomy syndrome	1	...	1
Active rheumatic heart disease	1	...	1
Total	35	3	32
Other illnesses			
Acute hepatitis and Laennec's cirrhosis	9	...	9
Acute glomerulonephritis	2	...	2
Infectious mononucleosis	2†	...	2
Recent streptococcic infection	6‡	...	6
Suspected syphilis	17§	...	17
Essential hypertension	12	1‖	11
Total	48	1	47

* Includes two patients with combined rheumatoid and gouty arthritis.
† Heterophil antibody titer, 1:896 and 1:1,792.
‡ Rheumatic fever or acute glomerulonephritis. Antistreptococcin units given: 50, 100, 12, 125, 166, and 2,500.
§ Twelve with negative and 5 with positive findings in Venereal Disease Research Laboratory tests.
‖ Bentonite flocculation test titer: 1:2,048.

The remaining seven patients had minimal inflammatory joint changes of a chronic nature involving, in most cases, only a few joints. All had a normal hemoglobin level, but some had an elevated sedimentation rate. Five, however, received therapy with gold salts and/or steroids at one time or another. These six patients most probably had a low-grade type of rheumatoid arthritis.

Rheumatoid Spondylitis.—The serum of 19 patients with rheumatoid spondylitis was tested. The diagnosis was reconfirmed prior to the performance of the test and was based on clinical and x-ray findings. Most of these patients also had peripheral joint involvement. However, in all of them, the initial episode was that of spondylitis, the peripheral manifestations occurring later. Only two individuals had

a positive result in the bentonite flocculation test, and only in a titer of 1:32. Fourteen of these patients had a titer of 0. This, in our opinion, is further evidence that rheumatoid arthritis and rheumatoid spondylitis, even when followed by peripheral joint manifestations, are probably two distinct clinical entities.

Other Rheumatic Conditions.—The serum of 35 patients with other rheumatic diseases, conditions in which the diagnosis is often confused with rheumatoid arthritis was tested. These results are also summarized in table 3. Thirty-two members of this group had negative findings, and three had positive reactions. Two of the patients with a positive result had coexistent gouty and rheumatoid arthritis and have been reported on previously. The other patient had hemolytic anemia and multiple systemic disease, considered to be systemic lupus erythematosus, and at autopsy was also found to have homologous serum jaundice.

Other Illnesses.—A group of patients was selected from the medical ward and clinics of the Pennsylvania Hospital, who, because of the nature of their illnesses, could conceivably have abnormal protein or antibody production and consequently be more likely to exhibit a false-positive reaction in the bentonite flocculation test (table 3). Only 1 of these 48 patients had a positive result. This patient is being followed up at the Hypertension Clinic. At the present time, there is no evidence of an active or incipient rheumatoid arthritis.

Of patients with liver disease, 16% have been previously reported to give false-positive results in serologic tests for rheumatoid arthritis.[11] None of nine patients with either chronic or acute liver disease, one of whom was in hepatic coma, gave a positive result in the bentonite flocculation test.

Summary and Conclusions

A total of 160 patients' serums have been subjected to the bentonite flocculation test. The test is easier and less expensive to perform than any of the heretofore described serologic tests for rheumatoid arthritis.

Eighty-three per cent of 48 patients with definite rheumatoid arthritis and 33% of 12 with probable rheumatoid arthritis had positive findings in the flocculation test. These results are comparable to those in previously reported serologic tests with more difficult and expensive procedures.

Only 2 of 19 patients with rheumatoid spondylitis had positive results, and only in the lowest positive titer, although the majority of these patients have subsequently developed peripheral joint involvement. This, again, stresses that these two conditions probably have different etiologies.

Only 3 of 35 patients with other rheumatic conditions exhibited positive results, and 2 of these had had previous diagnosis of combined gouty and rheumatoid disease. Only one, then, a patient with systemic lupus erythematosus, had a true false-positive reaction. Previous reports stated that 20 to 30% of patients with this condition will give false-positive reactions to serologic testing for rheumatoid arthritis, suggesting a possible relationship between the two conditions.

Of 48 hospital and clinic patients comprising a heterogeneous group of conditions characterized by altered protein metabolism, only one gave a positive result. This patient had a mild type of hypertension with no evidence of a rheumatoid state, but further studies and observations are indicated.

This report substantiates the conclusion that the bentonite flocculation test is the most recent, useful advance in rheumatoid serology and is an additional step toward the development of an accurate, simple, inexpensive, and dependable laboratory aid for the diagnosis of rheumatoid arthritis.

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EXTRAHEPATIC COMPLICATIONS ASSOCIATED WITH CIRRHOSIS OF THE LIVER

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The treatment and prognosis of alcoholic cirrhosis of the liver must take into account the possibility of coexistent disease in other organs. The frequency of extrahepatic disease was studied in the histories of 201 patients in whom the diagnosis had been established by the anamnesis of chronic alcoholism and (in 55 cases) by examination of tissues. The diseases most frequently found were chronic lung disease, diabetes mellitus, peptic ulcer, and cholelithiasis (32, 19, 17, and 17 cases respectively). The symptoms associated with cirrhosis in the 201 patients were spider angioma, ascites, palpable spleen, and hematemesis in 55%, 52%, 27%, and 15% respectively. Although there is disagreement as to the significance of some of these associations, they suggest that the patient with alcoholic cirrhosis has an increased tendency to develop extrahepatic disease.

Our investigation into the problem of chronic alcoholism has included clinical studies of the patients who have developed alcoholic cirrhosis of the liver (Laennec's cirrhosis). In addition to the usual complications of hepatic decompensation and portal hypertension, the occurrence of extrahepatic disease has frequently modified management and prognosis of these patients. This study surveys these diseases occurring outside the liver.

Methods

The clinical records of 201 patients with alcoholic cirrhosis of the liver were analyzed. These cases were found by evaluating the records of the 574 patients who had a diagnosis of cirrhosis made in the University Hospital during the years 1950 to 1955. Only the records of patients with a history of chronic alcoholism and evidence of cirrhosis were utilized in this study. A tissue diagnosis of portal cirrhosis was established in 55 of the 201 patients, 24 by liver biopsy and 31 by autopsy. Three of the autopsied patients displayed a combination of alcoholic and postnecrotic cirrhosis. Those patients with a tissue diagnosis of only fatty infiltration of the liver were excluded from this study.

The remaining 146 alcoholic patients were considered to have cirrhosis by objective clinical evidence. These patients had either a sulfobromophthalein retention greater than 15% in 45 minutes or the combination of sulfobromophthalein retention greater than 5% in 45 minutes and the presence of ascites, splenomegaly, or esophageal varices. If these abnormalities could be reasonably explained on some other basis, e. g., congestive heart failure or extrahepatic biliary obstruction, the case was excluded from the study unless additional evidence in favor of cirrhosis was present, e. g., spider angioma (hemangioma) or typical serum protein level abnormalities. In this clinical group, of course, we often could not rule out other types of cirrhosis or simple fatty infiltration of the liver.

Of the 574 patients considered to have cirrhosis, 373 were excluded from this study for several reasons: 198 patients had insufficient or equivocal evidence of cirrhosis, 82 were considered to have postnecrotic cirrhosis or portal cirrhosis without alcoholism, and 93 had cirrhosis of some other type, especially biliary and cardiac cirrhosis.

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Results

The frequency of various disease states in the 201 patients with alcoholic cirrhosis is given in the table. Because of the small number of patients in some categories, percentages have not been included. In the subsequent paragraphs, for the sake of simplicity, the "liver biopsy" group of cases has been combined with the "clinical" group to augment the clinical group to 170.

Patients' Statistics.—The ages of the patients when the diagnosis of cirrhosis was originally established in this hospital ranged between 24 and 87 years. Sixty-eight per cent of the patients were between 40 and 60 years old, the median age being 50 years. For males, the median age at the time of diagnosis was 52 years, while for females it was 43 years. In the autopsy group the ages at the time of death ranged between 41 and 87 years, the median age being 57 years.

There were 157 males and 44 females. Seven of the males and three of the females were Negro. All

of the remaining patients were Caucasian. In the autopsy group there were 23 males and 8 females, including one Negro female.

Liver Function Tests.—A series of liver function tests was obtained in most of the patients at the time a diagnosis of cirrhosis was initially considered. Determination of the sulfobromophthalein retention at 45 minutes helped to grade the severity of hepatic dysfunction as mild (less than 15%), moderate (15 to 50%), or severe (more than 50%). Hence, dysfunction was considered mild in 42 cases, moderate in 121 cases, and severe in 38 cases.

Hematemesis.—Thirty-two patients had vomited blood within the preceding three years, generally within the preceding month or during hospitalization. The source of bleeding was ascribed to esophageal varices in 18 patients (with x-ray evidence alone in 11, autopsy proof alone in 5, and combined proof in 2), to duodenal ulcer in 3, to superficial gastritis in 1, and to diffuse gastrointestinal bleeding in 1.

Results of Examination.—Spider angioma, ascites, and a palpable spleen were found in 55%, 52% and 27% of the 201 patients respectively. In the autopsy group these features were found in 65%, 74%, and 32% respectively. Spider angioma was not found in any of the 10 Negro patients.

Esophageal varices were demonstrated in 23 (14%) of the 170 clinical patients and in 19 (61%) of the autopsied patients. Bleeding was ascribed to these varices in 18 of these 42 patients, 11 occurring in the clinical group and 7 in the autopsy group. In 5 of the 19 patients with varices in the latter group, upper gastrointestinal x-rays had been described as normal; in only one of these patients, however, had bleeding occurred. It is also of interest that in these 19 patients with varices, spider angiomas were noted in 16, the 3 exceptions including 1 Negro and 1 moribund patient with an incomplete physical examination; in the 12 autopsied patients without esophageal varices, spider angiomas were noted in only 4.

Upper gastrointestinal x-rays were obtained in 150 of the 201 patients. There were no abnormalities in 101, esophageal varices in 27, hiatus hernia in 11, antral gastritis in 3, and duodenal ulcer in 8. Cholecystograms were obtained in 102 patients. There were no abnormalities in 32, faint visualization in 18, nonvisualization in 42, opaque calculi in 6, nonopaque calculi in 2, and questionable calculi in 2. In the group of 42 patients with nonvisualized gallbladders, 31 studies were done when the patient's sulfobromophthalein retention was greater than 20%.

Diseases Present.—In addition to the total group of 19 patients with established diabetes mellitus, there were 6 patients with either borderline fasting hyperglycemia or mild glycosuria without blood sugar level determination. Blood sugar levels were not measured in 94 patients, but urinalyses were done in all 201 patients. Glucose tolerance tests were not considered diagnostic of diabetes mellitus unless the fasting blood sugar levels were also elevated. One patient was not included because his hyperglycemia coincided with an attack of acute pancreatitis.

The 10 cases of peptic ulcer in the clinical group consisted of one active duodenal ulcer, eight healed duodenal ulcers, and one gastric ulcer. In the autopsy group there were two patients with acute bleeding duodenal ulcer, two with small acute duodenal ulcer, one with chronic duodenal ulcer with perforation, and two with small gastric ulcer. In one patient, the bleeding duodenal ulcer was not recognized before death.

The cholecystogram results have been described above. Two patients had previously had cholecystectomy for gallstones. Most of the gallstones discovered at autopsy had not been suspected clinically. In addition, there were two cases of acute cholecystitis without stones which contributed to the death of two patients in the autopsy group. An-

Diseases Associated with Alcoholic Cirrhosis

	Basis for Diagnosis of Cirrhosis			
	Clinical	Liver Biopsy	Autopsy	Total
Total no. of patients	146	24	31	201
Diabetes mellitus, no.	12	2	5	19
Peptic ulcer, no.	10	..	7	17
Cholelithiasis, no.	8	2	7	17
Pancreatitis, no.	1	..	3	4
Chronic lung disease, no.	21	1	10	32
Hypertension, no.	12	1	1	14
Congestive heart failure, no.	7	1	1	9
Myocardial infarction, no.	2	..	1	3
Malignant neoplasm, no.	7	2	4	13

other two patients in the autopsy group had chronic cholecystitis without stones; this increased the frequency of gallbladder disease in this group to 11 of 31. These patients included seven males and four females.

Although only one case of pancreatitis was confirmed in the clinical group, two additional patients had histories suggesting recurrent pancreatitis. Many other patients with nonspecific pain in the upper part of the abdomen did not have serum amylase or lipase level determinations. The three cases of acute pancreatitis in the autopsy group had not been suspected clinically. Pain was described in only one of the three patients, and even in this patient it was not emphasized. Nevertheless, the pancreatitis was moderately severe in each case, was superimposed on chronic pancreatitis in two patients, and was accompanied by terminal hepatic coma in two. A serum amylase level was obtained in only one of the three patients; this was on a postmortem specimen and was within normal limits. There was surprisingly no overlap between these three patients and the seven autopsied patients with cholelithiasis.

Most of these patients in both the clinical and autopsy groups had chronic bronchitis with obstructive emphysema, associated with excessive cigarette smoking. The remaining patients had active tuberculosis, chronic pneumonitis of uncertain etiology, bronchial asthma, and bronchiectasis.

There were 14 patients with hypertension, and in each instance the diastolic pressure was greater than 100 mm. Hg. Except for two with chronic nephritis, these patients were considered to have essential hypertension. In only 1 of the 14 patients with hypertension was the diastolic pressure persistently above 120 mm. Hg. Several patients, however, reportedly had had hypertension in the past and were not examined at this hospital until their cirrhosis had become severely decompensated. Three of the patients in the clinical group had had "strokes."

Of the three patients with myocardial infarction, two had typical histories and electrocardiograms of old infarctions. One autopsied patient had a fatal myocardial infarction superimposed on an old infarction. The cirrhosis was severe in only one of the three patients. Three additional patients had angina pectoris; hence, there were six patients in all with coronary artery disease.

In the congestive heart failure group, there were nine patients with cardiac decompensation; two had hypertension, one had aortic insufficiency, and six probably had arteriosclerosis.

The clinical group included nine patients with malignant neoplasms: three of the lungs, two of the cervix, one of the colon, one of the larynx, and one of the tongue; one patient had carcinomatosis of unknown origin. In the autopsy group were one patient with hepatoma, one with carcinoma of the esophagus, one with prostatic carcinoma, and one with malignant degeneration of a rectal polyp—a total of 13 in the two groups.

In regard to other associated diagnoses, there were 13 patients with syphilis (2 with tertiary and 11 with latent), 6 with gout, and 5 with psoriasis. In several patients there was a history suggesting functional hypoglycemia, but this was proved in only one case. Organic hypoglycemia was not established in any patient. There were several patients with chronic renal disease, but acute glomerulonephritis was not observed.

Cause of Death.—Death was ascribed to gastrointestinal hemorrhage in 13 patients, hepatic coma in 8, postoperative shock in 2, peritonitis in 2, pulmonary infarction in 2, myocardial infarction in 1, pneumonia in 1, and acute gastric dilatation in 1. Gastrointestinal hemorrhage was due to esophageal varices in seven, diffuse intestinal bleeding in three, duodenal ulcer in two, and superficial gastritis in one.

Factors contributing to death included pulmonary infarction in two patients, acute pancreatitis in two, acute cholecystitis in two, diverticulitis in two, and various infections in four. Terminal bronchopneumonia and terminal cholemic nephrosis were not tabulated. There were also 15 deaths without autopsy, 8 at this hospital and 7 away from this hospital. The major causes appeared to be hepatic coma, extrahepatic malignancy, and gastrointestinal hemorrhage (in two).

Comment

Some months after we had outlined and instituted our own studies of this problem, MacDonald and Mallory [1] reported a study on the natural history of postnecrotic cirrhosis. Their study included some interesting figures on the incidence of extrahepatic complications in 221 autopsied patients; these diseases were as follows: diabetes mellitus, 4.8%; active pancreatitis, 6%; gastric and duodenal ulcer, 9%; nonhepatic neoplasm, 12%; moderate or severe degree of atherosclerosis and myocardial infarction (six patients), 73%; and primary hepatic carcinoma, 14%.

It has been our impression that the patient with alcoholic cirrhosis has an increased tendency to develop extrahepatic disease. It seems logical that the chronic alcoholism, the altered dietary intake, and the multiple metabolic changes secondary to the hepatic disease should adversely affect tissues and organs throughout the body. To prove this postulate, however, is beyond the scope of this paper. A parallel analysis of an appropriate control group has been unavailable.

A review of the literature reveals considerable disagreement about the significance of certain disease interrelationships. Attempting to associate diabetes mellitus with portal cirrhosis is a good example.[2] Merely establishing the diagnosis of diabetes in the presence of liver disease can be difficult. The glucose tolerance test findings in cirrhosis may simulate those seen in patients with early diabetes. The fatty liver of the obese diabetic person or the enlarged liver of a patient with poorly controlled diabetes may be erroneously interpreted as indicative of cirrhosis. Pancreatitis is more frequent in alcoholics;[3] 10 to 15% of patients with chronic pancreatitis develop frank diabetes mellitus, and probably many more have an impaired glucose tolerance typical of diabetes.[4] Hemochromatosis may erroneously be considered as simple portal cirrhosis with diabetes mellitus.[5] Pancreatic deficiency secondary to Kwashiorkor and other diseases of malnutrition may simulate diabetes.

In our study, 9.5% of the 201 patients had established diabetes mellitus; an additional 3% may possibly have had diabetes, as demonstrated by a borderline glucose tolerance curve.

Referring specifically to the autopsy group, 5 of the 31 autopsied patients had diabetes mellitus (16.1%), 7 had peptic ulcer (22.6%), 11 had cholelithiasis or cholecystitis (35.5%), 3 had pancreatitis (10%), 10 had chronic lung disease (30%),

4 had malignant neoplasms (12.9%), and there were 3 (10%) with hypertension, congestive heart failure, and myocardial infarction.

Summary

An analysis was made of 201 cases of alcoholic cirrhosis of the liver (Laennec's cirrhosis). The disease was proved in 24 patients by liver biopsy, and in an additional 31 by autopsy. Effort was directed toward analyzing disease occurring outside the liver in these patients. Such extrahepatic complications included diabetes mellitus, peptic ulcer, cholelithiasis, pancreatitis, chronic lung disease, cardiovascular disturbances, and malignant neoplasms.

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INTERNAL FIXATION OF THE FIBULA IN FRACTURES OF BOTH BONES OF THE LEG

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In 15 cases of fracture of both bones of the leg, internal fixation of the fibula was carried out as the principal means for splinting the tibia. The effectiveness of this method is explained by the anatomical relationship of these two bones. Eleven of the 15 cases were acute fractures of the supramalleolar region, but the advantages of the operation were also demonstrated in cases of infected nonunion of the tibia, since the area of fracture could be stabilized without disturbing the tibial site. Functional results have generally been gratifying. Internal fixation of the fibula is effective in the following situations: supramalleolar fractures, badly comminuted or compound diaphysial fractures, transcondylar fractures, and fractures with nonunion or malunion.

Although fixation of the fibula as a means of handling fractures of both bones of the leg may be in rather general usage, it is our opinion that its merits have not been sufficiently emphasized. In our experience with a relatively modest number of cases we have been impressed with the advantages of the method and have, for selected cases, adopted it as standard procedure.

In the period from 1952 through 1957, only 15 of a total of 443 fractures of both bones of the leg were treated by members of the orthopedic staff of John Sealy Hospital by means of internal fixation of the fibula. We are thus aware of the limitations of open reduction and fixation of the fibula as a method of treatment, but we are equally aware of the effectiveness of this method among those fractures of both bones of the leg which, because of

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level of involvement or because of degree of comminution or compounding, may not be treated readily or effectively either by conservative means or by internal fixation of the tibia.

The fibula is the natural splint of the tibia. It is firmly bound to the larger bone through the ligaments of one diarthrodial joint, the proximal tibiofibular, and of one syndesmosis, the distal tibiofibular, and through the fibers of the interosseous membrane, this relationship constituting a second syndesmosis (fig. 1). The proximal joint is situated posterolaterally and has an oblique transverse plane with the head of the fibula actually resting partly beneath the lateral condyle. The distal joint

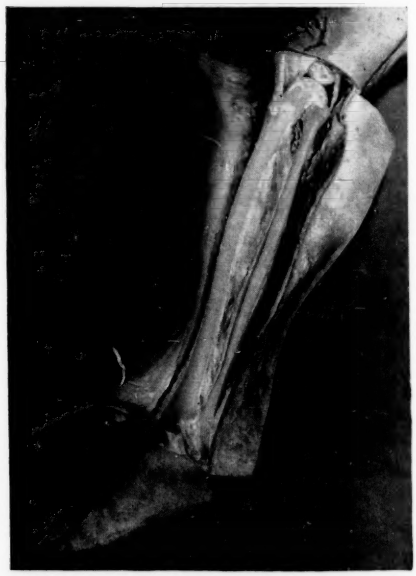

Fig. 1.—Anterior dissection with tibia and fibula freed of overlying musculature, to show proximal and distal joints and interosseous membrane. Inclination of major fibers of interosseous membrane distally from tibia to fibula is evident.

has a vertical plane, and the ligaments in this area incline obliquely distally from tibia to fibula as do the principal fibers of the interosseous membrane.[1]

Because of this anatomic arrangement, the tibia is often visualized as a support for the fibula, a non-weight-bearing bone of secondary importance. The fibula, on the other hand, may indeed support the tibia through these same structures as in fractures of the tibia alone. Because it often unites with disconcerting readiness, the fibula may actually assume some of the load of the tibia and will even increase in lateral dimension when there is delay or failure of tibial union. In addition, it should be noted that the ligaments of the two joints often remain intact in fractures of both bones, and thus tibial fragments are displaced with the fibula. The interosseous membrane is frequently torn, but, if the two joints are intact, reduction of one bone will tend to realign the other. With these observations in mind, one may consider as anatomically sound the restoration of fibular continuity in certain difficult fractures of both bones of the leg.

The concept of utilization of the fibula as the splint of the tibia is an old one. Lane,[2] in 1914, suggested open reduction of the fibula in abduction ankle fractures. Farr,[3] in 1927, mentioned the use of open fibular reduction in fractures with badly compounded or comminuted tibial components. Campbell,[4] in 1939, proposed open reduction of the fibula for unstable oblique and comminuted fractures of the tibia, for stabilization of ununited fractures of the tibia, and for bimalleolar fractures.

Of the 15 fractures in our series (table 1), 13 were acute and 2 were nonunions. Of the 13 acute fractures, 11 were of the supramalleolar area, one of the shaft, and one of the upper extreme or trans-

TABLE 1.—*Fractures Treated by Means of Internal Fixation of the Fibula, 1952 through 1957*

Level of Fracture	Acute, No.		Nonunion, No.	Total
	Open	Closed		
Supramalleolar	7	4	1	12
Lower one-third	..	..	1	1
Diaphysial	1	..	..	1
Transcondylar	..	1	..	1
Total	8	5	2	15

condylar area of the tibia. Eight of the acute fractures were of the open variety. Two patients had bilateral supramalleolar fractures. Of the nonunions, one was of the lower one-third and one of the supramalleolar region. A third case of failure of union, a supramalleolar fracture, was treated by us as an acute fracture with fibular fixation and by the same means as a nonunion. Its inclusion as a separate fracture would increase to 16 the total number.

From the available literature and from our own experience it is apparent that in fractures of both bones of the leg fixation of the fibula is occasionally a useful mode of treatment in (1) ankle fractures,[5] (2) supramalleolar fractures, (3) severely comminuted or compounded diaphysial fractures, (4) transcondylar fractures, and (5) fractures with nonunion or malunion. This list is further qualified in the sections below, which include only those types of fractures with which we have had personal experience.

Supramalleolar Fractures

Among the most difficult to handle of fractures of both bones of the leg are those involving the supramalleolar region of the tibia. This region has no muscle attachment and thus no protective or

supportive soft tissue other than the overlying tendons. Fractures occurring at this level tend to be severely comminuted and disorganized because of the lack of soft tissue support, and they are often compounded because of the immediately subcutaneous plane of the tibia anteromedially.

These fractures may be roughly classified as transverse (fig. 2*A* and *B*), resulting from direct trauma; spiral-oblique (fig. 2*C* and *D*), resulting from torsion; and compressed (fig. 2*E* and *F*), resulting from trauma transmitted through the ankle. The transverse fractures are usually strictly supramalleolar in level, being 2 or 3 cm. above the mortise; the spiral-oblique fractures extend into the lower one-third of the tibia. Joint involvement in these two types is not, as a rule, severe. Compression fractures, however, tend to involve the malleoli and to cause severe disruption of the articular surface of the tibia.

Perhaps the more common methods of handling supramalleolar fractures are by means of manipulation and plaster only or by the incorporation in plaster of distracting Steinmann pins through cal-

Fig. 2.—*A*, roentgenograms, dated Sept. 22, 1952, showing transverse compound supramalleolar fracture, with no joint involvement, in 45-year-old man. *B*, roentgenograms of patient in *A* showing appearance of fracture on April 14, 1958. Consolidation had occurred at four months. *C*, roentgenograms taken Jan. 7, 1955, showing a compound comminuted spiral-oblique supramalleolar fracture, with no joint involvement, in 43-year-old man. *D*, roentgenograms, dated March 25, 1958, show use of slotted plate to maintain reduction in fibula of patient in *C*. Consolidation occurred at six months. *E*, roentgenograms, dated July 15, 1957, showing compound supramalleolar fracture of compression type, with marked joint involvement, in 37-year-old woman. *F*, roentgenograms dated March 4, 1958, show reduction and control of short fibular fragment with Rush nail in patient in *E*. Consolidation occurred at four months.

caneous and proximal tibia. One may attempt reassemblage of the tibial fragments by the use of multiple transfixation pins or screws, but it is hazardous to disturb from the original clot these fragments, the blood supply of which is at best pre-

carious. Because of the level of fracture, metal fixation of the tibia is usually impractical or ineffective.

Open reduction and fixation of the fibula for supramalleolar fractures has received reserved recognition in the literature. The most complete coverage of the subject is to be found in the French literature in the report of Rieunau and Gay,[6] in 1956, and in the monograph of André Mony [7] in the same year. These men have used intramedullary fixation exclusively with success, and their observations are very much the same as our own.

The fibular involvement in these fractures is often less than that of the tibia, there being a simple or a moderately comminuted closed fracture. If the fibula is reduced and stabilized, the fracture is then in a sense one of the tibia alone; tibial length is restored, fragments may be to some extent controlled or manipulated, and alignment is often surprisingly good. It should be remarked that restoration of length and alignment is important even in those cases for which ankle fusion is anticipated later. That most of these fractures are open makes even more desirable the fixation of the fibula, which may be approached through untraumatized tissue.

TABLE 2.—*Analysis of Supramalleolar Fractures*

	Classification		Joint			Results	
Case No.	Type	Condition	Involvement	Fixation	Consolidation, Mo.	Anatomic	Functional
1	Transverse	Open	...	Plate	3	Poor	Excellent
2	Transverse	Open	2+	Plate	6	Fair	Good
3	Spiral-oblique	Open	...	Plate	6	Fair	Excellent
4R	Compression	Open	4+	Nail	4	Poor	Fair
4L	Compression	Closed	4+	Plate	Nonunion	Poor	Fair
5R	Compression	Closed	4+	Plate	4	Fair	Poor
5L	Compression	Closed	4+	Nail	4	Fair	Fair
6	Spiral-oblique	Open	2+	Plate	6	Fair	Good
7	Spiral-oblique	Open	...	Plate	4	Fair	Excellent
8	Compression	Open	2+	Nail	4	Fair	Good
9	Transverse	Closed	+	Plate	4	Fair	Excellent

If the fragments will accommodate a plate, this type of fixation is used; if the distal fragment is short, intramedullary fixation is used. Application of a plate is favored when this is possible because the procedure necessitates but one incision and because the extreme narrowness of the medullary cavity in some fibulas makes difficult the introduction of a pin or nail of adequate caliber. Shortening of the fibula may be necessary in fractures where there is loss of tibial substance or tendency to medial settling.

The stability gained with fibular fixation facilitates plaster application. After open reduction a long-leg posterior plaster splint or bivalved circular plaster is used. Straight long-leg circular plaster is applied after suture removal and subsidence of swelling. Some effort should be made to control with plaster any tendency of the fracture to settle.

Of the 11 fractures (table 2) in our series, 3 were of the transverse, 3 of the spiral-oblique, and 5 of the compression type. Three were treated with intramedullary nails and eight with slotted plates. The time of fracture consolidation has varied from three to six months from the date of operative reduction. There has been one nonunion in an individual with fractures of both legs. In this instance fibular fixation was also used in the secondary grafting procedure.

Anatomic results have often been poor; functional results have, on the whole, been gratifying (table 2). Patients with malalignment or marked joint involvement have been encouraged to use canes and have been made aware of the possible future need for joint stabilization. One secondary ankle fusion has been performed because of pain.

Diaphysial Fractures

In 1927, Charles Farr, in a short discussion of fractures of the tibia and fibula, stated that, "in selected cases of fracture of the tibia and fibula, notably when the tibia is badly comminuted or compounded and especially when infection has set in, it is possible to operate upon the fibula alone." Butterworth and Clary,[8] in 1945, reported the use of fibular fixation in 9 of 179 combat fractures of tibia and fibula because of loss of tibial length or substance due to marked comminution and compounding. The procedure was carried out initially as a temporary or emergency measure, but the results were so satisfactory that this method was adopted as definitive treatment for all such fractures. Carpenter and others,[9] in 1952, listed in their report 24 leg fractures treated by open reduction, with fibular fixation being the method of choice in 6 of these fractures. Coughlin,[10] in 1955, reported satisfactory results in three cases of comminuted compound fractures of tibia and fibula treated by means of fibular fixation.

Our own experience is limited to one compound fracture with severe comminution (fig. 3*A* and *B*). In this case a 5-in. slotted plate was applied to the fibula on the day of injury, the approach being through intact soft tissue. The compounding wound was cleaned, the tibial fragments were molded slightly, and the wound was closed. The wound healed primarily. Walking was permitted in plaster at 6 months, and consolidation was complete at 11 months. There is moderate posterior bowing, but the functional result is good. It is our opinion that the stability achieved in this case by means of fixation of the fibula aided in control of infection, promoted healing, and significantly reduced the morbidity.

Transcondylar Fractures

Transcondylar fractures or fractures of the proximal end of the tibia which are associated with overriding fractures of the fibula may be corrected with reduction and stabilization of the fibula. This possibility is illustrated in a case of this sort in which reduction of the fibula alone corrected rather accurately the tibial alignment (fig. 3*C* and *D*). A fault in operative technique rather than poor choice

of method accounts for the loss of the original excellent position (fig. 3*E*). Loosening of the screws in the splint allowed migration of the fibular fragments and resulted in loss of reduction in the tibia. This situation illustrates well the need in certain cases to fix the fibula rigidly. The plaster in this instance did not control the settling. As a consequence the knee is in valgus and the functional result is fair.

The restoration of alignment in the original reduction in this case was possible because of the intactness of the proximal tibiofibular articulation which allowed the fibula to lift the proximal tibial fragment back into position.

Nonunion

Of our three cases of failure of union, infection occurred in two. In the third case, as previously

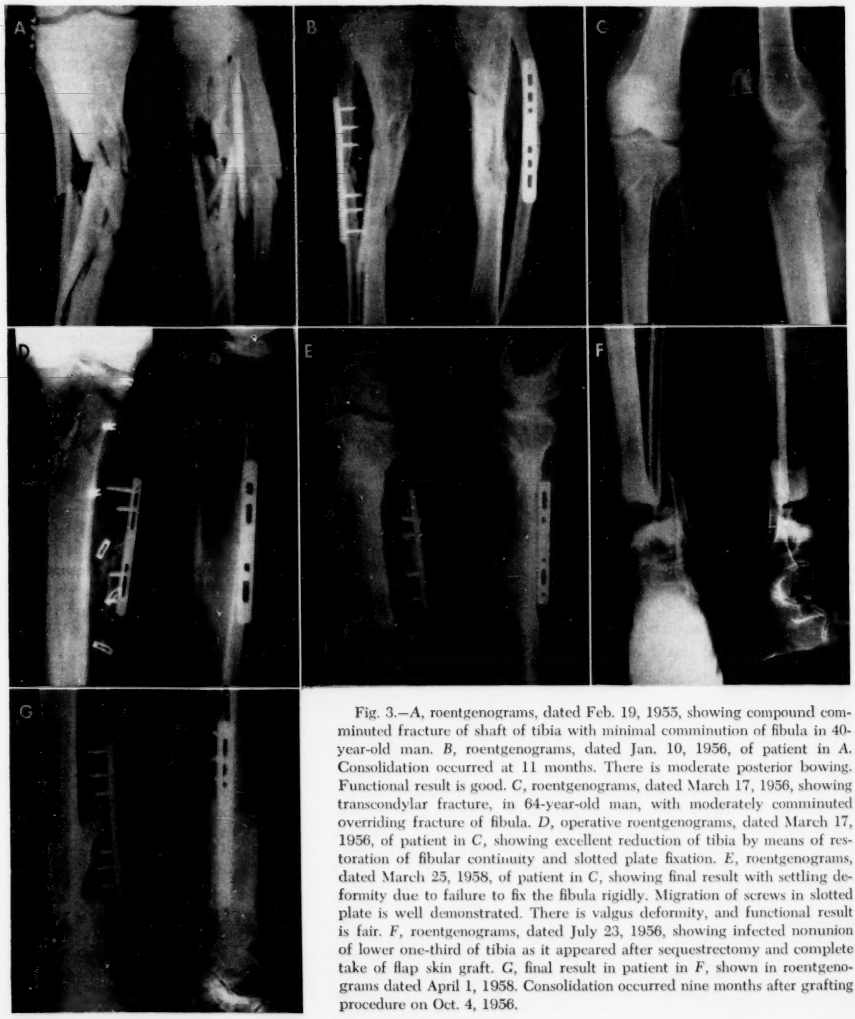

Fig. 3.—*A*, roentgenograms, dated Feb. 19, 1955, showing compound comminuted fracture of shaft of tibia with minimal comminution of fibula in 40-year-old man. *B*, roentgenograms, dated Jan. 10, 1956, of patient in *A*. Consolidation occurred at 11 months. There is moderate posterior bowing. Functional result is good. *C*, roentgenograms, dated March 17, 1956, showing transcondylar fracture, in 64-year-old man, with moderately comminuted overriding fracture of fibula. *D*, operative roentgenograms, dated March 17, 1956, of patient in *C*, showing excellent reduction of tibia by means of restoration of fibular continuity and slotted plate fixation. *E*, roentgenograms, dated March 25, 1958, of patient in *C*, showing final result with settling deformity due to failure to fix the fibula rigidly. Migration of screws in slotted plate is well demonstrated. There is valgus deformity, and functional result is fair. *F*, roentgenograms, dated July 23, 1956, showing infected nonunion of lower one-third of tibia as it appeared after sequestrectomy and complete take of flap skin graft. *G*, final result in patient in *F*, shown in roentgenograms dated April 1, 1958. Consolidation occurred nine months after grafting procedure on Oct. 4, 1956.

mentioned, treatment was also by means of fibular fixation as an acute fracture. One of the infected fractures is used for illustration.

The patient, who originally had an oblique compound fracture of the lower one-third of the tibia, was first observed one month after injury when there was ulceration over the fracture site with exposure of a metal plate. The plate was removed, the wound cleaned, and a plaster cast was again applied. Six months later a sequestrectomy was performed, and during the same admission a flap graft was applied to the skin defect. Fifteen months after removal of the original plate (fig. 3*F*), the site of nonunion was exposed and grafted with iliac bone, the grafts being placed liberally between the two bones. The fibula was shortened to allow approximation of the tibial fragments, and stabilization was obtained by means of a slotted plate applied to the fibula. Consolidation occurred nine months after operation. Figure 3*G* shows the final follow-up roentgenogram. The functional result is good.

It is noteworthy that, in some cases of infected nonunion, stabilization of the area by means of fibular fixation—the tibial site remaining undisturbed—enhances the possibility of healing and resolution of infection.

Surgical Approach

The fibula is easily accessible throughout its length in the plane between the peronei anteriorly and the triceps surae posteriorly. In the region immediately superior to the external malleolus, the peroneal tendons are retracted posteriorly. The incision at any level may follow an imaginary line extending from a point just behind the external malleolus to one just behind the head of the fibula. The common peroneal nerve must be isolated and protected in approaches to the upper end, and occasionally one encounters, at the distal end, branches of the musculocutaneous nerve.

Summary and Conclusions

Open reduction and fixation of the fibula in certain difficult fractures of both bones of the leg is an anatomically sound procedure. Our experience has shown that fixation of the fibula is an effective method of treatment in the following four distinct leg fracture problems: supramalleolar fractures, badly comminuted or compound diaphysial fractures, transcondylar fractures, and fractures with nonunion or malunion.

When indicated, open reduction and fixation of the fibula has the general advantages of (1) converting a fracture of both bones to one of the tibia alone, (2) restoring to the tibia length, alignment, and stability, (3) facilitating manipulation and eliminating undue handling of tibial fragments, (4) allowing approach through untraumatized skin and soft tissue in compound fractures, (5) affording stability for grafting in nonunions, (6) enhancing the efficiency of plaster and simplifying its application, and (7) reducing morbidity.

Addendum

Recently we have splinted the fibula in a comminuted segmental fracture of the tibia, soft tissue damage precluding tibial fixation. Length and alignment are well maintained.

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BALANCE AMONG THE SCIENCES.—It seems . . . much more probable that human happiness will come from discoveries in the biological sciences than from discoveries in the physical sciences. If there were a choice between a cure for cancer and economic nuclear power—most of mankind would choose the cure for cancer. As a corollary, it seems . . . inescapable that the current preponderance of mankind's scientific effort toward the physical, rather than the biological, sciences is wrong. . . . I would consider this to be one of the most important public responsibilities of science at large: to redress the balance between the physical and biological sciences, to direct more of the world's scientific resources along lines which are more nearly concerned with the issues of human happiness.—A. M. Weinberg, Prospects in International Science, *Bulletin of the Atomic Scientists*, December, 1958.

UPPER ARM BLOCK ANESTHESIA IN CHILDREN WITH FRACTURES

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Regional block anesthesia is especially useful for fractures of the arm in children. The technique here recommended involves an axillary route instead of the supraclavicular route. When the injection is made the proximal part of the humerus is used as a "backstop," and the terminal portion of the axillary artery serves as a constant and convenient landmark; the median and musculocutaneous nerves lie anterolateral to the artery, while the ulnar and radial nerves lie respectively anterior and posterolateral to it. Using this site for the injection eliminates the danger of pneumothorax, and by producing a sympathetic blockade it improves circulation in the arm. The present series of 80 patients with fractures included 72 children 10 years of age or under. Premedication consisted of pentobarbital given intramuscularly. The anesthetic used was lidocaine (Xylocaine) hydrochloride in 1.5% concentration with epinephrine 1:100,000, and the average volume injected was 10 cc. With the moderate sedation used and the reassurance of freedom from pain, the overwhelming majority of the patients have been extremely cooperative.

An effective, safe, simple method of brachial block anesthesia is desirable. The advantages of a conscious patient who can take care of his secretions and, if necessary, go home directly after simple fracture management are quite evident. The most important consideration is, of course, the full stomach. The majority of children we see with arm fractures qualify immediately for a block, because the child with an empty stomach is virtually nonexistent. There is probably no physician who does not know of some instance of death or serious complication occurring after the use of general anesthesia for a fracture in a patient who had a full stomach, vomited, and then aspirated. We further believe that the parent's best information on the time of last food ingestion is poor information, because of the inherent nature of children to eat incessantly. One additional fact that needs emphasis is that once the injury occurs all digestion stops for a period of many hours—at least six hours, and this is a minimum figure. Thus, even a six-hour wait after injury does not entirely lessen the hazard of general anesthesia. The use of narcotics in the immediate post-traumatic period also further prolongs the retention of gastric contents. Lavage of the stomach is an ineffective procedure because of particle size. Induction of vomiting, by either drug or direct pharyngeal stimulation, is unpleasant and gives no assurance that the stomach is empty.

Advantages of Block by Axillary Route

The use of brachial block by the usual supraclavicular route in patients of all ages has been a generally unsatisfactory procedure because of the far too frequent complication of pneumothorax. In addition, the hazard of subclavian artery hematoma is ever present. Both of these lead to further hospitalization, and this is most certainly contrary to the purpose of any block.

In 1949 Accardo and Adriani [1] presented a technique of blocking the brachial plexus by an axillary route. The method involves the use of the proximal humerus as a "backstop," instead of the first rib or the pleural dome, and utilizes the terminal portion of the axillary artery as a constant and easy to locate landmark rather than the indefinite measurements of the midpoint of the clavicle and "one fingerbreadth above" (fig. 1).

At the level of the insertions of the pectoralis major anteriorly and the latissimus dorsi posteriorly, the terminal portion of the axillary artery is palpable. At this level the nerves are still so centripetal that, with use of the artery as a landmark, the nerves are easy to block. The median and musculocutaneous nerves and their sensory cutaneous components are anterior and anterolateral to the artery; that is to say, they are "above" and "above and beyond" the artery. The ulnar nerve is inferior to, or "below," the artery. The radial nerve is posterolateral, or "below and behind," the artery.

With the arm at 95 degrees abduction from the body and in neutral rotation, the artery is palpated at the level of the insertion of the pectoralis major, and a skin wheal is raised directly over the artery, the physician making sure that the needle bevel is down and that the local solution is coming from the end of a 1-in. 25-gauge needle as it enters the skin. The needle is then directed above the artery, and 2 to 4 cc. of drug is deposited above, and above and beyond, the artery. The abduction is maintained, the needle is withdrawn to the subcutaneous area, and the arm is put into considerable external rotation at the shoulder. The needle is reintroduced below the artery, and 1 to 2 cc. of drug is deposited; then the needle is advanced virtually to the humerus so that it is below and behind the artery, and 2 to 4 cc. of drug is deposited. Aspiration is performed before each injection. Needle and

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humerus should be at a 90-degree angle. If a paresthesia is elicited, an injection of 0.5 to 1 cc. of drug is done promptly at this position; paresthesias are not deliberately sought. It has been our experience that the median and musculocutaneous nerves are much easier to block with the arm in neutral rotation; likewise, the ulnar and radial nerves are much easier to block with the arm in considerable external rotation (fig. 2).

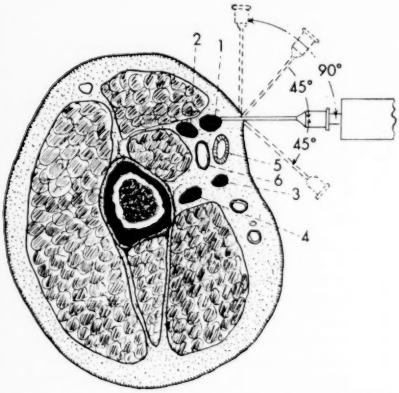

Fig. 1.—Brachial plexus block by axillary route. Cross-section is at junction of axilla and arm (through line 1, fig. 2). 1, median nerve; 2, musculocutaneous nerve; 3, ulnar nerve; 4, radial nerve; 5, brachial artery; and 6, vena comitans.

We have, in general, used injectable pentobarbital for premedication in these children. Those patients weighing less than 40 lb. (18 kg.) have been given 1 mg. of pentobarbital intramuscularly per pound of body weight; those weighing more than 40 lb. have received 0.6 mg. per pound, to a maximum of 50 mg. One-half is used for intravenous administration. This dosage will give moderate sedation in the average child, but he will be awake and cooperative. The objection has been voiced occasionally that children are not fit candidates for block procedures. We have not found this to be the case; in fact, with the moderate sedation outlined above and the reassurance of freedom from pain, the overwhelming majority of the patients have been extremely cooperative.

Another advantage of the block is the sympathetic blockade that develops to the periarterial sympathetic chain, as well as to the sympathetic fibers in the nerve trunks themselves. This results in an improved circulation, which is of benefit in such vascular-compromising fractures as the severe supracondylar fracture. A secondary benefit is the more rapid resolution of soft tissue edema adjacent to the fracture site. The site of injection, of course, makes a pneumothorax impossible, and the use of a 25-gauge needle virtually eliminates the chance of a hematoma.

Summary of Cases

In a total of 80 patients indication for the block was fracture of distal one-half of the humerus in 17, fracture of the radius and/or ulna in 41, fracture of the hand or fingers in 6, tendon transplants in 3, soft tissue surgery below the midhumerus 12, and diagnostic 1. Of these 80 patients, 72 were 10 years of age or under. The youngest patient was 6 weeks of age and had markedly displaced fractures of the radius and ulna. In the 80 cases there was only one in which the block was not effective; this was an open reduction of a supracondylar fracture. The reason for this failure is not clear, because the patient was checked with needle point before the incision was made. The only explanation we have is that this might have been innervated by some aberrant branch from the cervical plexus. Occasional difficulty has been encountered in blocking the musculocutaneous nerve; it was found at operation that external rotation of the shoulder has a positive tendency to swing the nerve considerably laterally from the median nerve, which remained close to the artery.

We have used 1.5% concentration of lidocaine (Xylocaine) hydrochloride with epinephrine hydrochloride, 1:100,000, in most of these cases. We thought it preferable to use the 1.5% concentration

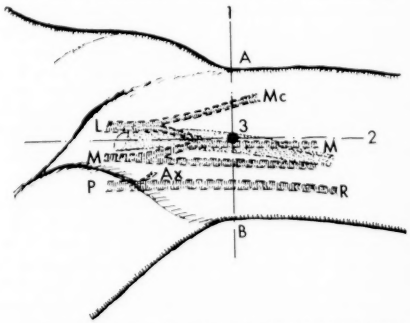

Fig. 2.—View of axilla showing landmarks for brachial plexus block by axillary route. Line 1 is drawn through points of insertion, *A*, of pectoralis major and, *B*, of teres major muscles into the humerus. Line 2 bisects line *AB* and falls directly over brachial artery. Wheal is raised at point 3. *L* is lateral cord of plexus, *M* medial, and *P* posterior; *Mc* is musculocutaneous nerve and *R* radial nerve. Note that axillary nerve *Ax* has been given off before site of block.

because of the more profound anesthesia it could afford the patient and because of the possibility that it might further potentiate the tissue penetrating quality that lidocaine is felt to have. We chose to use it with epinephrine because of the much slower absorption, which might protect the patient from a drug reaction.

In this series of 80 cases, we had only one minimal reaction, that of twitching at the corners of the patient's mouth; she had received 20 cc. of

2% solution of lidocaine, which is more than we would now use. The reaction was easily treated with a small amount of pentobarbital given intravenously; oxygen is also always kept available for use with any possible reaction. Our average volume of drug used was 10 cc. The smallest volume used was 1.5 cc. in the 6-week-old baby. If one wishes to use a tourniquet, a narrow subcutaneous "bracelet" of a weaker solution of drug is placed around the arm at the level of the block. Anesthesia of the fibers from the cervical and thoracic roots that are not parts of the brachial plexus will result.

If one and one-half to four hours of anesthesia are desired, 1% solution of tetracaine (Pontocaine) hydrochloride is added to the lidocaine, so that the final mixture has 1.5 mg. of tetracaine per cubic centimeter of solution. This will give a quick onset from the lidocaine and duration from the epinephrine and tetracaine. The tetracaine is available in 20-mg. (2.0-cc.) ampuls.

Conclusions

Brachial block anesthesia by the axillary route, as described by Accardo and Adriani,[1] is an excellent, safe method of regional anesthesia. The nerve supply of the arm is blocked without the possibility of thoracic complications. Thoracic complications from supraclavicular blocks are quite frequent and at times serious.

This block has been especially useful in the treatment of recent fractures in children, as one may assume there is food in the child's stomach and therefore a risk of aspiration if general anesthesia is used. The resulting sympathetic block is also of value in certain cases, e. g., supracondylar fractures of the humerus.

The technique is simple. Children have not objected to the technical use of the needle and have cooperated well. In 80 consecutive cases there has been only one failure. It is interesting to note that, of these cases, twenty-seven occurred during the months of April and May, 1958. This indicates the growing interest in this type of block anesthesia in our locality, although we have been using the method since 1954.

899 Detroit St. (6) (Dr. Turner).

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THE RESIDENT AND THE MEDICAL STUDENT

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As students progress through the maze of medical training, they face new problems and increasing responsibility. They begin to appreciate more fully the concern teachers and senior colleagues show about their development. Furthermore, when the residency program is embarked on, a position is entered which requires the showing of concern for the junior colleagues, the medical students. Residents in teaching hospitals have as regular responsibilities not only patient care but also teaching interns and medical students. Teaching responsibility is stimulating but also somewhat ambiguous. In an attempt to clarify what teaching responsibility at the resident level means, I shall draw on my own brief experiences and on the experiences of my colleagues on the resident staff of Presbyterian-St. Luke's Hospital in teaching medical students within the framework of the case method. I hope this will encourage other residents

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The resident is generally presumed to play some part in the hospital educational scheme, especially since emphasis on bedside teaching is increasing. His role in the educational team may not be evident to him, to his senior colleagues, or to the medical student. His abilities and obligations need to be more adequately defined. This will enable him to make an orderly approach to basic principles, to develop teaching skill, and to exercise initiative. He can use ancillary teaching methods, such as reading assignments or conferences, that can be very effective as supplements to ward rounds. Efficient communication of significant information thus becomes a greater reality to the educational team, with improved care of the sick as the ultimate goal.

and also visiting physicians to make their thoughts on the subject available to residents, interns, and medical students.

As residents, we learn to teach because we must and, to varying degrees, because we enjoy it. That our senior colleagues are interested in our learning to care for patients is evident. However, they are also interested in our becoming good teachers; the resident was made an integral part in undergraduate teaching programs when the emphasis in teaching third and fourth year medical students was shifted from formal lectures to medical clerkships. Originally, the residency program existed for the sole purpose that residents might learn patient care. Now the program has expanded to the extent that residents must also be teachers.

The following questions seem particularly pertinent to the resident-medical student relationship: What part is the resident to play on the educational team? How should he carry out this part? Can residents as a group develop and maintain a scholarly tradition in medical student teaching by complementing the efforts of the senior faculty members involved in clerkship teaching?

The Resident's Role

As I began my medical residency, I understood little of what would be expected of me as a teacher; however, as my residency has progressed I have come to a fuller realization of the challenge evoked by teaching medical students—one which certainly taxes a resident's resourcefulness. On the basis of brief experience, I would suggest that the answer to the previously stated questions may be found by reflection on the resident's exact role in relation to the "professor" (or chief of service) and the medical students.

To borrow from cybernetic terms, the resident's function at a glance seems best described as that of a bridge of communication between the medical student and the "professor"—or that of a two-way transmitter. The basic difficulty in this function concerns the kind and extent of modulations of messages transmitted either way. In particular, how far should a resident go as a sorter of information, and how free in this function should he be to draw generally on medical information and teaching methods? The answers to these questions are of necessity related to the basic foundations of any educational process, teacher-student bonds, and, also, local hospital arrangements and individual personalities.

The answers do not come easily. For example, what Wiener [1] would call "jamming" in cybernetics seems to appear in two recent papers on medical education. The first paper, "Adventure in Pedagogy," [2] submits the hypotheses that "teachers may be major obstacles to student learning," that "people learn what they want to learn," and that "true learning is largely an emotional experience." It also states that a majority of the people involved in the seminar on which this article is based were provided "with a satisfaction they had not previously known." The nature of the "satisfaction" is not clear.

The second paper, "Disaster in Pedagogy," [3] is a rebuttal to the first. The author agrees that medical education should be improved. However, he submits that the stimulus for improvement comes from higher to lower levels through the maintenance of scholarly standards and not through an abused concept of "educationist's freedom."

The resident's position does not allow him to decide the final answers to these arguments. However, as residents we should have some definite approach toward our job of teaching medical students. Therefore, it seems to me that we might look to some reasonable authoritative basis in deciding on this approach. So far as the hypothesis that "learning is largely an emotional experience" is concerned, I would agree from personal experience that at certain times emotional factors influence efficiency in learning. But I do not agree that learning is "largely" emotional. Even in the area of religion, where some degree of emotional experience is evident, the importance of rational thought, logical argument, and scholarly standards is emphasized.[4] In medical education the maintenance of scholarly standards presupposes adequate leadership and also an effective system of communication between the leader (professor or chief of service), the resident, and the medical student.

Personally, I feel strongly that residents should draw on the experience of their senior colleagues, for experience implies that these individuals have made mistakes from which they have profited immensely throughout the years. Therefore, they should be in a position to help avert similar mistakes by their junior colleagues.

Perhaps medical education in America today faces the challenge of "The Revolution in Education" [5] that has been described for other branches of education. In medical education, intellectual originality must not be stifled by inadequate communication; however, it is just as vital that one who communicates, especially if it is his life's career, should have something to say based on a degree of intellectual originality.

My reasons for setting down my thoughts on medical education with special reference to the resident–medical student relationship are several. First, the literature on medical education with which the average house officer and medical student have intimate contact contains a paucity of clearly defined principles regarding this vitally important subject.

Second, in medical schools where clerkship teaching is a major part of the curriculum, it is mandatory that the resident be interested and capable to some degree as a teacher.

Third, although I feel that more enlightened residents are cognizant of this, the resident–medical student relationship properly effected is of practical advantage. That is, aside from the transmission of

information from the resident to the medical student, the medical student's presence and questions are a constant stimulus against the resident's succumbing to intellectual lethargy—just as the latter's continuous questioning of the professor is at another level. Likewise, the student profits in this system by more clearly finding his "self-image," [6] in that he becomes an integral part of the patient-care and educational teams.

Fourth, it is important that the resident form an individual philosophy or school of thought regarding his position in relationship to the professor, intern, and medical student. The hippocratic oath clearly charges every teacher to aid his junior colleagues, but the present structure of the clerkship program requires some further crystallization of the relationship of each member of the educational team. Often, the resident seems to be a "middleman" or a two-way transmitter of messages, at least as far as daily contact with medical students is concerned. This function seems valid, but only if it is accompanied by direct contact between the professor and the medical student and also if it allows the resident to express whatever awareness, resilience, and fertility of mind he may possess. In short, the resident should not be the professor's "yes man."

Fifth, the physician is, in one sense, a biological scientist. And, as Richardson [10] has aptly stated, he "needs to know much about biochemistry, and therefore about chemistry, and therefore about physics, and therefore about mathematics. . . . The comparative study of the sciences . . . helps us to see why the methods that are highly efficacious in one science are not useful in another." Therefore, to focus attention on a discipline which itself is concerned with a high degree of integration might be useful, and consequently the ensuing discussion is in terms of communication.

Problem of Communication

There are several apparent areas to which these concepts of communication can be applied. First, there is the matter of curriculum revision manifest in recent years by the increasing amount of bedside teaching at the medical student level with an accompanying decrease in formal lectures. The resident has not been involved in making this decision, but he has been directly affected by it. With this transition the resident has been thrust into a position of greater responsibility in teaching medical students; however, he may not have been impressed with this change, and his senior colleagues may not have evaluated his abilities and obligations adequately. Thus, in cybernetic terms there is a break in the bridge of communication, and this allows entropy to increase.[7] There is much in favor of clerkship teaching, but only when adequate emphasis is given to the necessity of reading and discussion and the degree to which the resident, intern, and medical student must participate.

Second, the resident might do something in addition to discussing patient problems on ward rounds with the medical students if he is to realize fully his potential in "communicating" with the medical students. The resident in the junior year can often benefit from the advice and experience of senior colleagues in effecting ancillary teaching methods. Often the matter may rest entirely with individual initiative and abilities of each resident, which may or may not be conducive to an orderly approach to understanding the application of basic principles.

Third, the importance of the integrity of the educational team may not be evident either to the resident or to the medical student. As is true with the "burn" team, the "cardiac catheterization" team, the "research" team, and the "patient-care" team, the members of the educational team should clearly understand the problems they face and the individual responsibilities they have in meeting these problems. Only by precise delineation of responsibility for each member of the educational team can effective communication be achieved and the tendency toward increasing entropy be abated. I wish to suggest that perhaps a portion of the solution of the questions concerning teacher-student contact may be achieved by more exact examination of cybernetics and the concept of entropy versus order. McCulloch [8] has recently alluded to the discrepancy between the number of afferent and efferent messages passing through the cerebral cortex (the former being by far the greater), and from his discussion we may infer the influence of coincidence as well as the influence of the number of useless messages on this discrepancy. We may now consider the practical importance of cybernetics in medical education.

Cybernetics in Medical Education

"Just as entropy is a measure of disorganization, the information carried by a set of messages is a measure of organization. . . . The information carried by a message [is] essentially the negative logarithm of its probability." [1]

An example of the quotation from Wiener's "The Human Use of Human Beings" is "Cancer is a bad disease." This statement has a high degree of probability in a number of situations; however, the statement "Nucleosides decrease erythrocyte osmotic fragility in hypotonic phosphate" is true for a much smaller number of situations and yet conveys more information. Effective education is concerned with the transmission of messages with significant information. Therefore, the maintenance of scholarly standards requires efficient communication. Two possible impediments to communication and effective education are the increasing size of medical school classes and the lack of interest in medical students on the part of an occasional resident. These impediments enhance the tendency toward increasing entropy.

Schrödinger,[7A] Wisdom,[9] McCulloch,[8] and Mascall[4a] have recently dealt with the more basic arguments on the definition and implications of the term entropy. Schrödinger, referring to Gibbs and Boltzmann, has expressed the statistical and sociological connotations of entropy by the formula, "entropy = k log D," where k is a constant and D a measure of disorder. Thus order is the reciprocal of entropy.

Due to the vastly increasing macrocosm of messages (facts or observations) to which we in medicine are continuously exposed, we are forced to reflect seriously on what material or messages are significant and essential and, consequently, how our methods of clerkship teaching can best resist the tendency toward increasing entropy. I wish to state candidly that I am not proposing that all medical educators devote their entire efforts to teaching methods, for such a proposition effected might result in the "progressive" undermining of the educational process which some observers[3] feel has occurred in our lower schools through the efforts of the "educationists." What I am proposing is an increasing awareness on the part of the resident's senior colleague, the professor or chief of service, of the relative positions of the resident, intern, and medical student on the educational team; this consideration will permit a certain degree of autonomy on the part of the resident in teaching and learning (i. e., as a transmitter and sorter of messages who can draw on contingent sources for information as well as directly from his senior and junior colleagues).

The resident has the obligation and responsibility of helping his senior colleague, the professor, in "getting the message across" to the medical student that he is an integral part of the patient-care and educational teams. As Keefer states,[10] "One of the important functions of the house staff is to join all other members of the group in the educational process of the undergraduate medical student." Caseley[10A] has also emphasized that the resident's "teacher-role" has often been taken for granted, and he has implied the necessity of more careful assessment and encouragement of the resident in this capacity. Osler,[11] in his address "Teacher and Student," has amply and succinctly defined the qualities prerequisite in a teacher, namely, "enthusiasm," "knowledge of the branch taught," and a "sense of obligation." He also considered personal contact between teacher and student to be essential. The resident may not have advanced to the state of knowledge of his seniors in a given subject, but he is totally capable of enthusiasm and a "sense of obligation."

Experience in Medical Clerkship Teaching

During our residency (and throughout our entire careers), we must grow in assuming responsibility for patient care and also in assuming teaching responsibility.[12] We gradually develop skill in teaching and learning (transmitting and sorting information), just as we develop skill in diagnosis and therapy. Both skills seem almost inextricably bound. How, then, can we best help to "get the message across"? At this point I wish to cite some of the experiences which have been noted in medical clerkship teaching at Presbyterian-St. Luke's Hospital with the University of Illinois senior medical students, particularly at the resident–medical student level.

First, attempting to cram a multitude of unrelated facts (or messages) into one's head is futile without some concept of basic principles (how to sort and classify messages or information). The professor (or chief of service or attending staff member) largely has the responsibility of emphasizing and clarifying these basic concepts by direct contact with the medical student. The resident is responsible for reiterating these concepts in light of their application to individual daily patient problems. From this it follows that the resident and medical student alike will investigate further these concepts by reading critically the fundamental literature on a given subject, which incidentally, is not necessarily synonymous with the latest journal article published. Subsequent investigation, discussion, and argument then provide the members of the educational team with greater intellectual enlightenment (i. e., by critically sorting and reclassifying significant messages and information) and will result in better patient care.

There are several ancillary teaching methods which, properly implemented, can be very effective. These are not new methods, but they have been used as supplements to ward rounds in communication between residents and medical students (i.e., in transmitting, sorting, and classifying information). Among these are student journal club, "coffee-break" 10-minute talks by medical students, outside subject study assignments, and "quizzes." These maneuvers have been tried by the resident staff for a period of time and have been pleasantly successful.

Student journal club, to which one hour each week has been devoted, consists of two students discussing recent articles of general interest agreed on by the resident and the students. The 10-minute talk, originated by another of the residents, consists of a short dissertation on one subject related to a patient problem currently on the ward. Special subject home study assignments outlined by the residents consist of hypothetical case problems related to similar situations seen by the students or derived from cases with which the residents had previous experience. The quizzes, given twice each quarter, consist of short-answer written questions derived from standard textbook sources plus an oral examination given by the residents. The oral examination consists of questions in internal medicine, x-ray film interpretation, and general pathology with clinical correlation. Residents from the radiology and pathology departments participate in these quizzes. No "grade" is turned in, although

the quizzes are gone over thoroughly with the students in order to point to areas of strength as well as weakness. These did not involve "spoonfeeding," for they pointed to areas of endeavor dependent on individual initiative and interest.

If these methods have been used successfully on previous occasions, the question arises as to why they should be more effective when utilized by residents than when utilized by senior faculty members. Perhaps they are not more effective when utilized by residents. There are some reasonable hypotheses regarding this question. One is that the resident may be more acutely aware of student deficiencies in the clerkship framework because of his more active student contact (i. e., the resident may have a given student on his floor or ward for three weeks with continuous daily contact or rounds). Another is that a given student may at times feel more free to raise certain questions with a resident than with a senior faculty member (this is not always true and does not imply that senior members of the educational team provide obstacles to learning). Third, the resident becomes intimately responsible for a portion of the medical student's intellectual development and benefits through this relationship by enhancing his own knowledge (by reciprocal transmission of messages with the medical student). Fourth, the individual medical student is evaluated at relatively infrequent intervals by the senior members of the educational team (i. e., in terms of examinations and final evaluation); the resident may be able to assist the student with certain difficulties in learning (sorting messages) at a point crucial to his final evaluation. These ancillary methods employed by the residents seem valid because they exist for the purpose of enabling the members of the educational team to become more proficient at interpreting data (sorting messages) and at classifying information and also for the purpose of ultimately improving patient care.

Conclusions

The resident's role on the educational team is important. His function is not only to transmit messages or information between the professor and the medical student but also to sort and modulate messages transmitted, to draw freely on general medical information, and to instill this information into the bridge of communication existing between the members of the educational team. Allowing the resident to exercise awareness, resilience, and fertility of intellect insures additional feeding of significant information into the pool of messages (or thought) transmitted along the bridge of communication and should help to insure maintenance of scholarly standards. Efficient communication of significant information then becomes a greater reality to the educational team. As Hutchins puts it, "A world community can exist only with world communications, which means something more than extensive short-wave facilities scattered about the globe. It means common traditions, common ideas, and common ideals." [13] I wish to submit that, through some consideration of the integrity of the educational team and the importance of efficient transmission of significant information in opposing entropy, our ultimate goal, optimal care of the sick, may be more nearly achieved.

I have alluded to some of our own "adventures in pedagogy," with emphasis on the transmission and sorting of significant messages or information by persons who have something to communicate and who are not merely concerned with the methods of communication. The resident is not the most experienced transmitter and sorter of messages on the educational team, but he does have an obligation as a teacher to do what is reasonably possible to aid the medical students for whom he is responsible. Thereby he broadens his own intellectual horizons, forms a sounder philosophy of human relations, and exercises a bit of Promethean will. Finally, the professor, the resident and intern, and the medical student should hold a consultation:

> A consultation comes in order next—
> You know what this is? In a certain place
> meet certain doctors to discuss a case
> and other matters, such as weather, crops,
> potatoes, pumpkins, lager beer, and hops.
>
> Rip Van Winkle, M.D.
> Oliver Wendell Holmes

1753 W. Congress St. (12).

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OPACIFYING GALLSTONES

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Certain biliary calculi become radiographically opaque after prolonged exposure to cholecystographic contrast mediums. The condition of prolonged exposure is fulfilled by the four-day iopanoic acid test. Opacification may be quite faint and recognized only by close scrutiny of the x-ray films. The four-day iopanoic acid test is a useful method for identifying bile duct stones. The test is, probably, the best available method for demonstrating bile duct stones in the presence of jaundice. The method is also helpful in identifying gallbladder stones in problem cases.

Certain gallstones become roentgenographically opaque after prolonged exposure to cholecystographic contrast mediums, with or without visualization of the gallbladder or bile ducts. We have called these calculi "opacifying gallstones."

Theander [1] observed the opacification reaction in an unproved case of cholelithiasis. We have reported proved cases of opacifying gallstones,[2] with in vitro reproduction of the phenomenon.[3]

X-ray Technique and Findings

Our observation of opacification of biliary calculi was made while exploring possible advantages of prolonged administration of iopanoic acid (Telepaque) in patients whose gallbladders could not be visualized or could be visualized faintly after the conventional examination with 3 Gm. of iopanoic acid. These patients were placed on a four-day regimen of 3 Gm. of iopanoic acid per day, 1 Gm. after each meal. A relatively fat-free diet was given during this period. The x-ray examination was made on the morning of the fifth day, with the patient fasting. We have called this prolonged preparation for cholecystography the "four-day Telepaque test." The test is well tolerated; diarrhea is controlled with paregoric. In one instance, opacification of biliary stones occurred with a similar regimen with iophenoxic acid (Teridax) used instead of iopanoic acid. We are exploring other variations of the four-day iopanoic acid test.

The opacified biliary calculi are usually characterized roentgenographically by a generalized faint increase in the over-all density of the stones and a sharp linear density outlining the periphery of the stones. The opacification of the stones may be quite faint and recognized only by close scrutiny of the x-ray films. When the iopanoic acid deposit on the surfaces of the stones is heavy, the density outlining the periphery of the calculus becomes thicker (fig. 1) and, occasionally, the stones appear homogeneously opaque (fig. 2). Most commonly, the opacification becomes evident on the third or fourth day of the iopanoic acid regimen, but, occasionally, it occurs on the second day and increases in intensity on the third and fourth days. In most instances of gallbladder calculus opacification, the gallbladder has been faintly visualized. When calculi in the bile ducts have been opacified, the ducts are usually not visualized. The opacification of calculi in the absence of visualization of the biliary structures indicates the marked sensitivity of this reaction.

From the divisions of radiology (Drs. Salzman and Spurck), pathology (Dr. Kier), and surgery (Dr. Watkins), Denver General Hospital and the University of Colorado School of Medicine.

Usually, all stones in a patient with cholelithiasis are either opacifying or nonopacifying; less commonly, stones in the ducts are opacifying while stones in the gallbladder are nonopacifying in the same patient. We have not encountered an instance in which the stones in the gallbladder were opacifying and the duct stones nonopacifying. Rarely, one or more of the stones in the gallbladder or in the ducts are opacifying and the others are nonopacifying. After completion of the four-day iopanoic acid test, the opacification of the stones persists for a variable period of time, ranging from 2 to 14 days, and then they gradually fade to complete disappearance.

Clinical Evaluation.—We have examined 123 patients with this test whose gallbladders either could not be visualized or could be visualized faintly after the conventional one-day 3-Gm. iopanoic acid test. A review of the findings revealed that 76 had probable or proved calculous biliary tract disease, while 32 had noncalculous biliary tract disease and 15 had a normal biliary tract. There were 13 pathologically proved cases of bile duct stones in the 76 patients with calculous biliary tract disease. Ten of the 13 patients, or over 75%, showed opacifying stones in the bile ducts with (4 patients) or without (6 patients) opacifying stones in the gallbladder. Three of the 13 patients with proved bile duct stones showed no opacification either because of extreme jaundice or because the stones were of the nonopacifying type. Cholangiograms with intravenously given iodipamide (Cholografin) sodium were obtained at the time of the four-day iopanoic acid test in 3 of the 10 patients with opacifying bile duct stones. The ducts could not be visualized in two of these three. In six pa-

tients, the opacifying stones were located in the gallbladder only. Nine of the 10 patients with opacifying bile duct stones had slight (bilirubin level, 1-2.5 mg. %) or moderate (bilirubin level, 2.5-5.0 mg. %) jaundice at the time of the four-day iopanoic acid test.

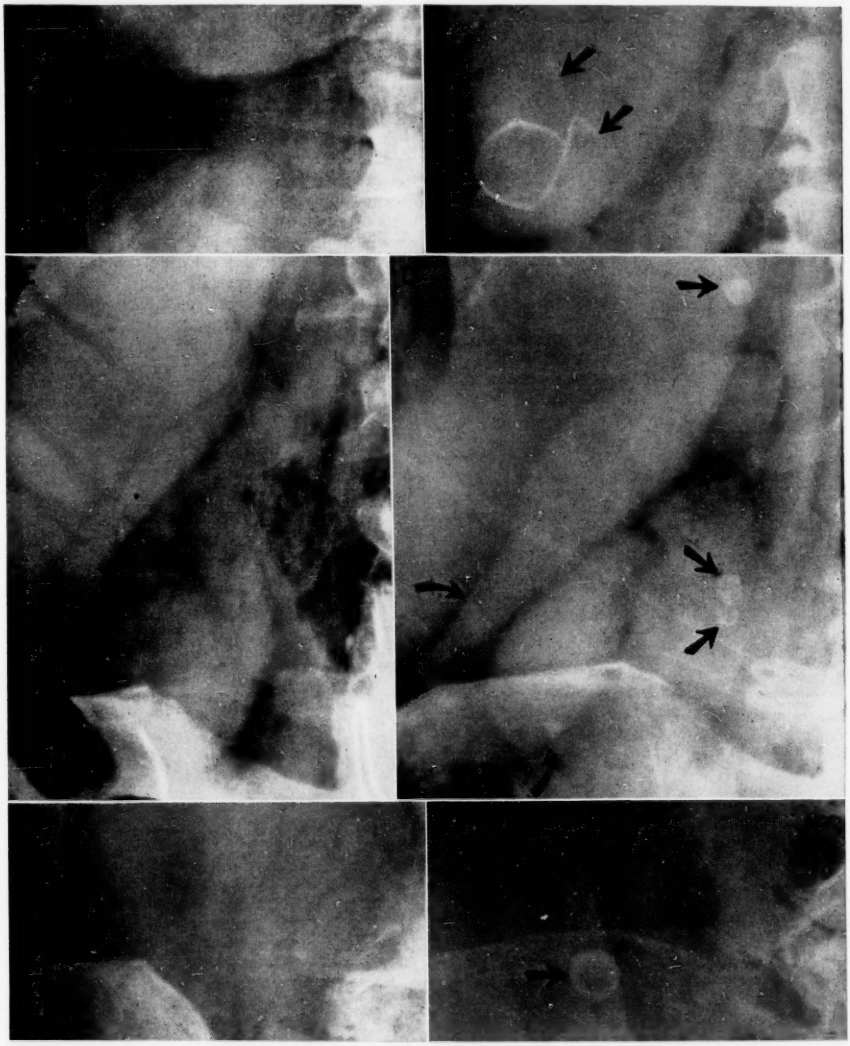

Fig. 1.—Roentgenographic results of test with 3 Gm. of iopanoic acid (Telepaque): *A*, after one day, no visualization of biliary structures and, *B*, after four days, opacification of three large gallbladder stones and faint visualization of gallbladder; *C*, after one day, no visualization of biliary structures and, *D*, after four days, opacification of three bile duct stones and faint visualization of ballbladder; *E*, after one day, no visualization of biliary structures and, *F*, after four days, opacification of solitary stone in gallbladder.

We have concluded from this analysis that the four-day iopanoic acid test is a useful method for identifying bile duct stones. The test is, probably, the best available method of demonstrating bile duct stones in the presence of jaundice, where cholangiography with use of iodipamide usually

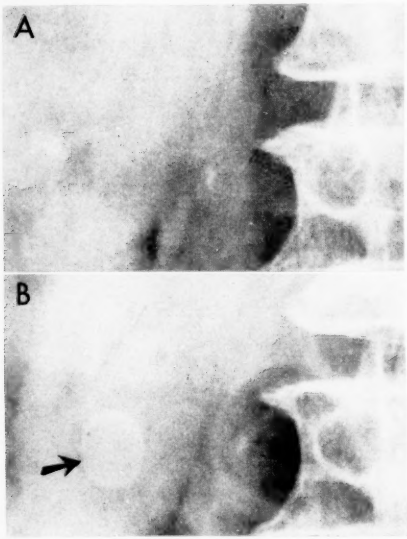

Fig. 2.—Roentgenographic results of test with 3 Gm. of iopanoic acid (Telepaque): *A*, after one day, no visualization of biliary structures and, *B*, after four days, opacification of solitary stone in bile duct, with no visualization of biliary structures.

fails in visualization of the bile ducts.[4] In an occasional problem case, the test is helpful in identifying stones in the gallbladder.

In Vitro Studies

The phenomenon of gallstone opacification has been reproduced in vitro. Bile duct calculi, showing the opacifying quality clinically, have been obtained at autopsy in the unopacified state and subjected to further in vitro study. Samples of such bile duct calculi in the unopacified state and samples of clinically nonopacifying gallbladder calculi were immersed in plastic tubes containing bile with iopanoic acid and normal bile. The first sample was obtained at laparotomy from the gallbladder of a patient who had received 3 Gm. of iopanoic acid the evening prior to the operation. The normal bile was obtained at autopsy from a gallbladder of a normal person. The tubes were x-rayed immediately, kept at room temperature, and x-rayed four days later (fig. 3). The stones showing the clinical opacifying quality were strikingly opacified in the tube of bile with iopanoic acid. The clinically nonopacifying stones were not opacified in this tube. There was no additional opacification of the opacifying stones or of the nonopacifying stones in the normal bile. These experiments have led us to believe that the opacification of calculi is the result of a deposition of iopanoic acid on the surfaces of the stones and that the opacifying quality is inherent in the stone and not due to an instability of the colloidal system of the bile.

Further experiments have indicated that the clinical x-ray phenomenon of opacification of certain radiolucent biliary calculi with prolonged administration of iopanoic acid can be reproduced in vitro with opacifying calculi and buffered 2% solutions of iopanic acid, iodophthalein (Iodeikon) sodium, and phentetiothalein (Iso-Iodeikon) sodium simulating the concentration of gallbladder contrast medium in a visualized gallbladder. The reaction may also be reproduced with buffered solutions of iodoalphionic acid (Priodax), iophenoxic acid, and iopanoic acid, but with some difficulty because of the insolubility of these contrast agents. Most in vitro studies have been accomplished with these contrast mediums because of the difficulty encountered in obtaining iopanoic acid–opacified bile at operation. The opacifying reaction did not occur with clinically opacifying stones and buffered 2% solutions of potassium iodide, iodipamide, methylglucamine diatrizoate (Renografin), diprotri-

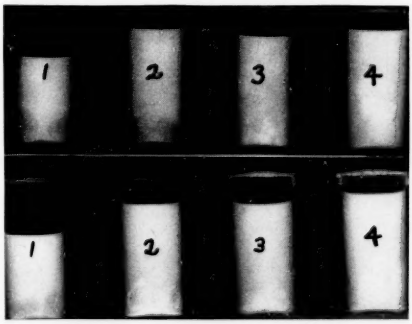

Fig. 3.—Results of test with normal bile and bile with iopanoic acid (Telepaque): (*top*) immediate x-ray, showing (*1*) gallbladder stones in bile with iopanoic acid, (*2*) bile duct stones in bile with iopanoic acid, (*3*) gallbladder stones in normal bile, and (*4*) bile duct stones in normal bile, and (*bottom*) x-ray after three days at room temperature, showing increased opacification only of bile duct stones in bile with iopanioc acid (*2*).

zoate (Miokon) sodium, acetrizoate (Urokon) sodium, sodium iodomethamate (Neo-Iopax), iodopyracet (Diodrast), and methiodal (Skiodan) sodium.

One hundred samples of biliary calculi found at surgery or autopsy at Denver General Hospital have been subjected to the in vitro test to determine the incidence of opacifying stones in this unselected group. Samples of each case of stones were immersed in a buffered 2% solution of iodophthalein sodium in plastic tubes. These tubes were x-rayed immediately, kept at room temperature, and x-rayed four days later (fig. 4). About 20% of stones collected in this manner proved to be opacifying. Grossly, the opacifying stones were always heavily pigmented, although not all pigmented stones proved to be opacifying.

Gallstone Type and Opacification Reaction

Aschoff[5] has classified gallstones into "pure" cholesterol, "pure" pigment, combined, infectious, and stasis types. The pure cholesterol stones are usually solitary and round and on section show a radiant structure of coarse cholesterol crystals. The pure pigment stones are multiple, black, small, and mulberry-shaped with amorphous structure. The combined stones are composed of a central pure cholesterol core with lamellar, peripheral layers of pigment, cholesterol, and, frequently, calcium. The infectious stones are generally multiple and faceted or lobulated. On section, these stones are lamellar and, frequently, fissured. The cholesterol-surfaced stones are yellow; the pigment-surfaced stones are dark brown to black. The stasis stones, usually found in the bile ducts, are frequently multiple, pigmented, and friable, consisting of a central infectious cholesterol stone core, which probably migrated from the gallbladder into the bile passages, and soft peripheral layers of pigment. Aschoff[5] described stasis stones as "earthy"; mud or gravel are common terms used to describe these calculi. Aschoff believed that the pigmented layers deposited on the surfaces of the cholesterol core result from the stasis of bile which accompanies bile duct stones.

The 100 cases of stones subjected to the in vitro test for opacifying quality were classified, as far as practical, according to Aschoff's terms, and the opacifying reaction of each classification was noted. All pure cholesterol stones were nonopacifying. All pure pigment stones were opacifying. Among the combined stones, there were nonopacifying and opacifying types. Among the infectious stones, all the yellow, cholesterol-surfaced stones were nonopacifying. The pigment-surfaced, infectious stones were both nonopacifying and opacifying. All stasis stones were opacifying.

Gallstones are essentially composed of varying quantities of cholesterol, inorganic salts (chiefly calcium carbonate and phosphate), and bile pigments (chiefly bilirubin and biliverdin).[6] A gallstone may be fractionated into these substances by their differential solubility in various solvents: cholesterol, ether; inorganic salts, hydrochloric acid; bilirubin, chloroform; and biliverdin, methyl alcohol. To determine which of the substances in an opacifying gallstone is responsible for the opacification reaction, an opacifying gallstone was fractionated into cholesterol, inorganic salts, and bile pigments. Samples of each fraction were immersed in plastic tubes of buffered phosphate and a buffered 2% solution of iodophthalein. The tubes were x-rayed after four days (fig. 5). The opacification reaction occurred only with the bile pigments.

The following experiments have led us to conclude that a major factor in the opacification phenomenon is a reaction between biliverdin on the surface of the stone and the contrast medium in

Fig. 4.—Samples of gallstones obtained at surgery or autopsy in unselected cases and immersed in plastic tubes containing buffered 2% solution of iodophthalein sodium: (*top*) immediate x-ray, showing calcified gallstones in 20, 23, and 26, and (*bottom*) x-ray after four days at room temperature, showing opacifying gallstones in 20, 24, 28, and 29.

the bile. Commercial cholesterol, bilirubin, and biliverdin were subjected to the in vitro test for opacifying quality. Samples of each substance were immersed in plastic tubes of buffered phosphate and a buffered 2% solution of iodophthalein. After four days, with these samples kept at room temperature, only the biliverdin was opacified. In addition, nonopacifying infectious cholesterol stones were induced to opacify in vitro after being coated with a layer of biliverdin. There are possibly other unknown substances in the stones which react in this manner with the contrast mediums in addition to biliverdin.

Comment

The hypothesis that the biliverdin in the stone reacts with the contrast medium in the bile, causing opacification of the stone, explains our experimental and clinical observations of the opacification phenomenon. Our knowledge of this reaction, however, is still meager and may belong in the category of speculation.

All pure cholesterol and all infectious cholesterol stones failed to opacify, and all pure pigment stones opacified as would be anticipated. The inconstant opacification of pigmented combined and infectious stones is probably due to the varying surface content of bilirubin and biliverdin in these stones. The high incidence of opacifying stones among bile duct stones which are usually the stasis type is of important clinical significance.

Here, again, there are gaps in our knowledge, but it would seem reasonable that the following sequence of events occurs in the pathogenesis of opacifying bile duct stones: These stones originate in the gallbladder, most commonly as infectious stones, and migrate into the bile ducts. The newly arrived bile duct stone is usually nonopacifying. Usually, the patient with bile duct stones is examined after clinical or subclinical episodes of obstruction and bile stasis. In the presence of extrahepatic biliary obstruction, elevation of the serum biliverdin level has been noted regularly.[7] Bile, regurgitated from the bile ductules into the blood, is the most likely cause of the serum biliverdin level elevation in patients with extrahepatic biliary obstruction. Although the chief pigment in normal human bile is bilirubin,[8] with stasis, bilirubin in the bile is probably oxidized to biliverdin which is deposited on the surface of the bile duct stone, converting the nonopacifying type of infectious duct stone to the opacifying stasis duct stone. Further work is in progress which, we anticipate, will define in greater detail the nature of the opacification reaction.

Summary

Opacifying gallstones precipitate contrast mediums from the bile on their surfaces, after prolonged exposure, with x-ray opacification. The four-day test with use of iopanoic acid (Telepaque), a prolonged preparation for cholecystography, is a useful method for identifying bile duct stones which opacify in over 75% of cases. The test is, probably, the best available method for demonstrating bile duct stones in the presence of jaundice. The method is also helpful in identifying gallbladder stones in problem cases. The gallstone opacification phenomenon has been reproduced in vitro and is due to a reaction between biliverdin on the surfaces of the stones and the contrast medium in the bile.

Fig. 5.—X-ray of tubes containing fractionated gallstone (cholesterol, inorganic salts, and bile pigments) immersed in buffered phosphate (*1*, *2*, and *3*) and buffered 2% solution of iodophthalein sodium (*4*, *5*, and *6*). Only bile pigments in *6* are opacified.

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TREATMENT OF MELANOMA BY ISOLATION-PERFUSION TECHNIQUE

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and
Edward T. Krementz, M.D., New Orleans

Metastatic melanoma on the lower extremity has been treated in eight patients by a new technique with use of phenylalanine mustard. An extracorporeal circulation system, consisting of a pump and a disposable oxygenator, was connected either with the common femoral artery and vein or with the external iliac artery and vein so as to achieve vascular isolation of the extremity. This system was then perfused with the phenylalanine mustard for one hour, after which it was flushed out and normal circulation was restored. The characteristic response of cutaneous metastases was a sequence of changes, in that they became blacker and flattened, a crust formed on the surface, and finally the lesion dropped off, leaving a light freckle. Not all melanomas responded in this way, but some lesions regressed strikingly and several disappeared completely. When the vascular isolation of the lower extremity was effective, the amount of phenylalanine mustard used (2 mg. or less per kilogram of body weight) did not seriously depress hematopoesis.

Melanoma is a challenging therapeutic problem because of the peculiar characteristics of growth and spread of these tumors. It is generally agreed that wide surgical excision of the primary lesion is essential, although there is lack of accord as to the necessity for and effectiveness of regional node dissection and for the removal, in continuity, of regional lymphatics.[1] The ultimate results of therapy are difficult to evaluate, because these tumors apparently remain quiescent for long periods of time and metastases may become evident many years after treatment of the primary lesion. Nevertheless, the five-year survival rate, after presumably adequate surgical excision, varies from 20 to 40%.[2]

Radiotherapy of melanoma has proved ineffectual, and the results with systemically administered nitrogen mustard have likewise been unimpressive. As cited by Luck,[3] Bergel and Stock first reported the synthesis of D and L-*p*-di(2-chloroethyl)-aminophenylalanine. Haddow, as reported by Bergel and Stock,[4] demonstrated the marked tumorocidal effect of this drug in animals. Working independently, Larionov and associates [5] also reported the synthesis of the same compound and called it sarcolysine. These workers found that sarcolysine caused complete regression of spindle cell sarcoma in rats. Larionov used a mixture of the dextrorotatory and levorotatory forms of the drug, but Bergel and Stock [4] and Luck [3] have shown that the levorotatory form is most active.

In 1957, it occurred to us that the toxic side-effects of this compound and other cancerocidal drugs could be avoided if a tumor-bearing area could be isolated from the general circulation and perfused with these agents. Thus, larger concentrations of the agents might be safely employed. Since there was evidence suggesting that the effects of radiation were potentiated by high oxygen tensions,[6] it was postulated that with use of a heart-lung apparatus for perfusing the tumor-bearing area the oxygen tension of the blood could be increased several times and the propulsive force of the pumping mechanism might produce an adequate distribution of the chemotherapeutic agent throughout the involved part. Techniques were developed in the laboratory for isolation and perfusion of the limbs, pelvis, mid-intestines, and lungs, and maximum safe dosages of nitrogen mustard and phenylalanine mustard were determined.[7] Additional studies also demonstrated that nitrogen mustard remains active in blood for about five minutes and that phenylalanine mustard is active for at least six hours.

Since June, 1957, these techniques have been applied in the treatment of 41 patients with malignant neoplasms of various areas.[8] Among this group were eight patients with melanoma of the lower extremities. This report concerns the techniques of isolation-perfusion in the treatment of melanoma of the lower extremity with use of phenylalanine mustard.

Technique

The extracorporeal circuit used in these studies consisted of a Sigmamotor pump and a disposable bubble oxygenator having a reservoir capacity of 500 cc. The oxygenator is primed with 500 cc. of fresh heparinized blood drawn from the patient immediately prior to operation. Simultaneous replacement of 500 cc. of citrated banked blood maintains the blood volume at a normal level. The common femoral artery and vein, or in some instances the external iliac artery and vein, are exposed through oblique incisions. After occlusion of these vessels proximally, suitable plastic cannulas

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are inserted in a distal direction. To complete vascular isolation of the extremity, an Esmarch bandage is placed at the crotch into the gluteal crease, pulled tightly, and secured to a Steinmann pin inserted into the iliac crest. Perfusion is then begun.

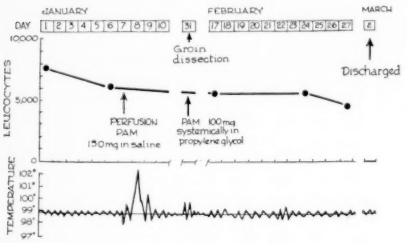

Fig. 1 (case 4).—Chart showing leukocyte response to phenylalanine mustard (PAM) administered first by perfusion of lower extremity and later systemically to patient with malignant melanoma.

The blood is oxygenated with 100% oxygen at a flow rate of 5 liters per minute. When the venous outflow and arterial inflow have been balanced, phenylalanine mustard is injected into the arterial line proximal to the pump to insure adequate mixing. The dose of phenylalanine mustard used varies with the type of diluent used and the mass of the tissue to be perfused. Since this agent is poorly soluble in isotonic sodium chloride solution and distilled water, 2 mg. per kilogram of body weight is used with these diluents. However, phenylalanine mustard is completely soluble in propylene glycol, so only 1.5 mg. per kilogram of body weight is used with this diluent. At the present time, the entire dose of phenylalanine mustard is administered and perfusion is continued for one hour. On completion of perfusion, the venous line is disconnected from the pump and the extremity drained of contaminated blood. Usually about 500 cc. can be removed in this way. Five hundred cubic centimeters of fresh blood is then administered through the arterial cannula and is removed by way of the venous line. The cannulas are then removed, the incisions in the artery and vein are repaired, and the tourniquet is released. Leukocyte and platelet counts are performed every other day after operation to determine the effect of perfusion on hematopoiesis.

This technique may be used as adjuvant therapy to surgical excision of the primary lesion or it may precede excision of recurrent melanomas. The following cases illustrate the use of perfusion in both circumstances.

Report of Cases

Case 4.—A 66-year-old man was admitted to Charity Hospital in New Orleans on Jan. 1, 1958, with a history of melanoma of the right heel. The patient had consulted his physician, who had removed the lesion and submitted it for histological examination. Physical examination revealed the site of previous excision of the lesion on the plantar surface of the right heel. There were several large nodes in the right inguinal region but no evidence of cutaneous metastases.

On Jan. 7, perfusion was performed with use of phenylalanine mustard in a dose of 2 mg. per kilogram of body weight dissolved in isotonic sodium chloride solution. After perfusion for 30 minutes, the site of excision on the right heel was widely removed and grafted.

There was no significant alteration in the leukocyte count after perfusion (fig. 1). On Jan. 31, groin dissection was performed and 7 of the 15 nodes removed were positive for neoplastic cells. There was evidence, however, of extensive tumor necrosis in the nodes (fig. 2). Because of the possibility of extension beyond the right lower extremity, a systemic dose of phenylalanine mustard was administered. The subsequent course has been uneventful, except for drainage from the groin incision and persistent edema of the leg; these are gradually subsiding.

Case 7.—A 56-year-old man was admitted to Touro Infirmary on April 30, 1958, with a history of metastatic melanoma, involving the left lower extremity, of two years' duration. In 1949, the patient noted a black mole, which bled freely, on the dorsal surface of the left foot. This was excised and on histological examination proved to be melanoma. Subsequently, he developed enlarged nodes in the left inguinal region but these were not treated. In 1956, a metastasis appeared on the anteromedial aspect of the left thigh and rapidly enlarged.

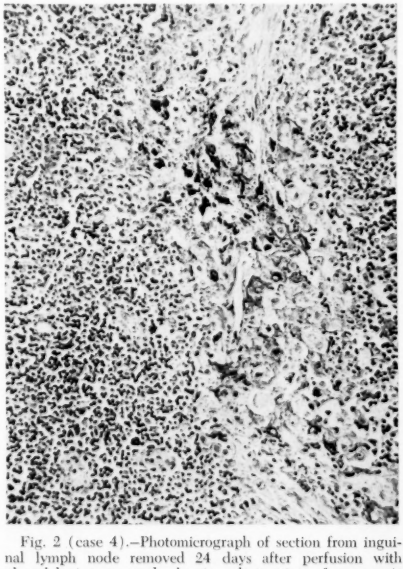

Fig. 2 (case 4).—Photomicrograph of section from inguinal lymph node removed 24 days after perfusion with phenylalanine mustard, showing destruction of metastatic tumor cells.

Physical examination on admission revealed a pale, emaciated man with a metastatic melanoma of the left thigh measuring 30 by 20 by 10 cm. (fig. 3). Its surface was infected and foul-smelling. There were three satellite nodules near the large lesion and a few nodes in the left inguinal

region but no evidence of systemic spread of the disease. Biopsy of the lesion revealed poorly differentiated melanoma (fig. 4A). After correction of a severe secondary anemia by administration of whole blood, perfusion was carried out on May 5, 1958. Two milligrams per kilogram of body weight of phenylalanine mustard dissolved in propylene glycol was injected into the extracorporeal circuit, and the extremity was perfused through the external iliac artery and vein for one hour. On completion of perfusion, several large lymph nodes along the external iliac vessels were removed en bloc. These subsequently failed to show evidence of melanoma.

The leukocyte count began to decrease on the 10th day after perfusion and fell to 2,400 per cubic millimeter on the 16th day; then it gradually returned to normal (fig. 5). On May 13, the eighth postoperative day, the large metastatic lesion, together with two of the satellite nodules, was widely excised. At the time of removal the large metastasis appeared to be almost completely necrotic, and this was confirmed on histological examination (fig. 4*B*, *C*, and *D*). However, viable tumor cells were present in some areas. On the 15th postoperative day, May 20, the defect was covered with a split-thickness skin graft. At the time of perfusion the entire extremity was moderately edematous; after perfusion the edema increased. During the first 10 days, the edema was brawny and there was reddish discoloration of the skin over the entire extremity. Gradually, the discoloration turned to brown and the edema subsided. Biopsy of the gastrocnemius muscle at the time of excision of the metastasis revealed marked edema, atrophy, and some hemorrhage but no necrosis of muscle cells. One month after perfusion, two remaining satellite nodules were excised (fig. 4*E* and *F*).

Comment

Among the eight patients with melanoma treated with phenylalanine mustard by the isolation-perfusion technique, six were treated for extensive cutaneous metastases, the primary lesion having been removed previously, and two had the primary lesion removed in conjunction with perfusion of the extremity. There was one patient with a solitary metastasis to the left lung, and the remainder were apparently free of disease outside of the involved extremity.

The first patient with melanoma to be treated by the isolation-perfusion technique has had follow-up studies for more than a year. The cutaneous metastases in this patient have undergone a rather characteristic sequence of changes, in that they become blacker and flatten, a crust forms on the surface, and, finally, the lesion drops off leaving a light freckle. Histologically, these gross changes consist of extensive infiltration with small mononuclear cells which appear to break up the neoplastic cells into islands and, eventually, the entire metastasis is replaced by fibrous connective tissue. During the year since treatment, almost all of the metastatic lesions have undergone these changes and only six of an original 175 cutaneous metastases remain. These have shown no evidence of growth, and apparently the disease is controlled. The urine was positive for melanin prior to perfusion but is now negative. Other patients have exhibited similar changes but follow-up studies have not been done long enough to determine the extent to which the disease is controlled. In one instance, there was striking regression of metastases which were originally from 1 to 3 cm. in diameter. In fact, several of these lesions disappeared entirely. However, after two and one-half months, two of the lesions started to enlarge and showed signs of activity. Perfusion was again done three months after the initial treatment with phenylalanine mustard. Subsequently, most of the residual lesions have been excised.

There was one death in this series. The patient was a 72-year-old man with metastatic melanoma covering almost the entire surface of the right lower extremity and with metastases to the iliac lymph nodes. Perfusion was accomplished through the abdominal aorta and vena cava with phenylalanine mustard used in a dose of 3 mg. per kilogram of

Fig. 3 (case 7).—Metastatic melanoma of left thigh.

body weight. Isolation of the perfused area was not complete, and severe depression of bone marrow became apparent on the seventh day; the patient died on the 15th day.

Depression of hematopoiesis after perfusion with phenylalanine mustard dissolved in propylene glycol and the absence of this complication when isotonic sodium chloride solution is used as a diluent is not explained. It may be a result of incomplete isolation and/or retention in the tissues of the more completely dissolved phenylalanine mustard.

Evidence, derived largely from the first patient who received perfusion but to a less extent from subsequent patients, suggests that phenylalanine mustard, in addition to destroying neoplastic cells

directly, also initiates certain changes which make these cells more susceptible to resistance factors of the host. This assumption is based primarily on the observation that regressive changes within the neoplasm continue long after the drug has become inactive and after the period of acute cellular necrosis resulting from the chemotherapeutic agent has passed.

It is apparent that not all melanomas respond to phenylalanine mustard in the same way and to the same degree. On the other hand, there may be other agents to which melanomas unresponsive to this drug will respond. Thus, there is a need for greater specificity of agents and some means of determining this specificity. Studies are now being conducted to evaluate the feasibility of using tumor transplants to determine the most effective chemotherapeutic agent prior to the use of the isolation-perfusion technique.

Summary

In order to administer high concentrations of chemotherapeutic agents for the treatment of cancer, a technique of isolating and perfusion of the tumor-bearing area has been developed. Eight patients with malignant melanoma have been treated by this technique. The regression, even disappearance, of neoplastic lesions in these patients indicates that phenylalanine mustard in high concentrations is effective against melanoma.

When the lower extremity was effectively isolated and phenylalanine mustard was administered in a dose not exceeding 2 mg. per kilogram of body weight, serious depression of hematopoiesis did not occur.

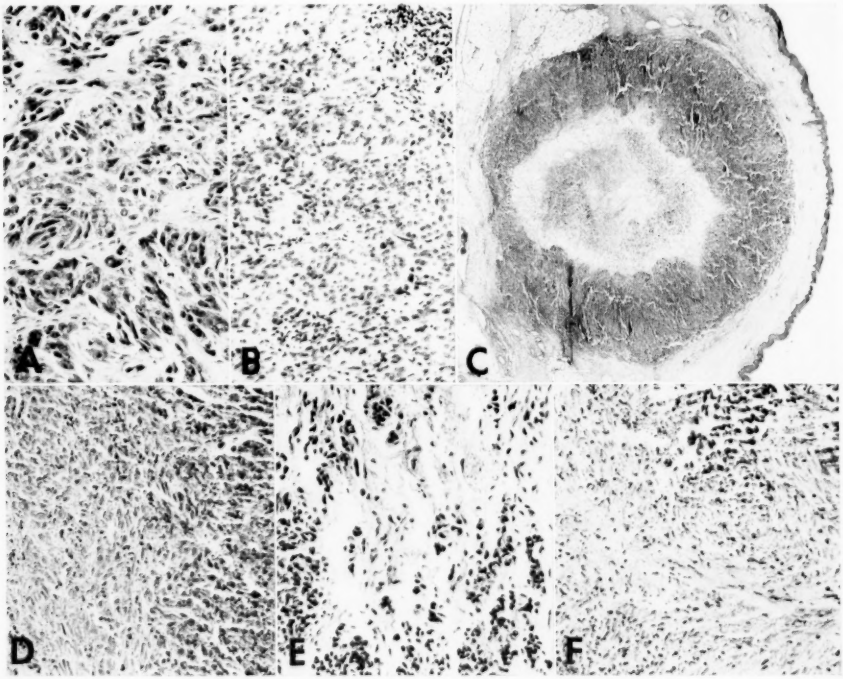

Fig. 4 (case 7).—Photomicrographs of sections from large metastatic lesion of thigh and subcutaneous satellite lesions. *A*, thigh lesion prior to perfusion; *B*, thigh lesion 48 hours after perfusion; *C*, satellite lesion, eight days after perfusion, showing extensive central necrosis; *D*, same lesion with higher magnification, revealing widespread necrosis with scattered areas of viable tumor cells; *E*, satellite lesion one month after perfusion, showing viable cells; and, *F*, also extensive destruction in many areas.

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The oxygenator used in this study was supplied by Abbott Laboratories, North Chicago, Ill.

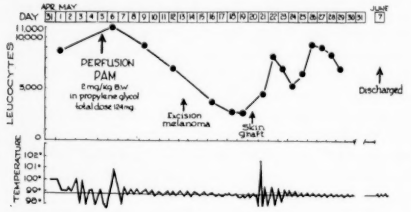

Fig. 5 (case 7).—Chart showing leukocyte response after perfusion of left lower extremity with phenylalanine mustard (PAM), with use of external iliac vessels.

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CLINICAL NOTES

ENDOTRACHEAL TUBE AS A SOURCE OF INFECTION

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Recently reports have appeared in the literature of an alarming increase in hospital infections, many of which are antibiotic resistant and presumably acquired after a patient's admission to the hospital. This is a serious indictment of present-day indiscriminate antibiotic therapy and of our hospitals. Many comprehensive investigations have been conducted in the wards and operating rooms to ascertain the cause of such infections. However, none of these studies has considered the endotracheal tube as a primary source of infection. As a part of the study of wound infections in the Memorial Center for Cancer and Allied Diseases, we undertook to determine if anesthetization equipment, and especially the endotracheal tube, might be a factor in nosocomial infections.

From the Memorial Center for Cancer and Allied Diseases.

Methods

Initially, we planned to study the anesthetization apparatus as well as the endotracheal tube. However, since the pilot study revealed only common airborne saprophytes from the machine and its parts, the study was focused on the endotracheal tube. Samples from the stock bottles of 5% solutions of hexylcaine (Cyclaine) hydrochloride, used routinely for topical anesthesia, were also cultured at random as the only other source of contamination during anesthesia.

For the past three years in this hospital, routine care of the endotracheal tubes after use has consisted of soaking them in a pan of water containing antiseptic soap with a hexachlorophene content of 0.6 to 0.8% for a period of hours, followed by scrubbing with a similar solution, air drying, and nonsterile storage. Just before use, the tubes have

been washed with this antiseptic soap by the anesthesiologist, rinsed in running tap water, and placed in a sterile towel until used. The endotracheal tube stylet has been treated in the same manner. Using this technique, we prepared two endotracheal tubes at the same time: one was used for intubation of the patient, and the other tube was used for culturing as a preintubation control. Cultures were done on both the control tube and the tube taken from the patient at the end of the procedure by immersion to approximately one-third of their length in thioglycollate broth.

The search for a simple, yet effective, method of sterilizing the endotracheal tube was divided into four phases when failure to obtain sterile controls in this pilot study indicated that our former technique was unsatisfactory. The first phase (13 cases) consisted of an analysis of the above-described methods. In the second series (7 cases), the endotracheal tubes were scrubbed with a brush on the outside for at least 30 seconds with soap containing 0.6-0.8% concentrations of hexachlorophene, followed by rinsing in running tap water. The third series of tubes (20 cases) was prepared by scrubbing with a brush on both the inside and outside for 60 seconds with the soap containing 0.6-0.8% concentrations of hexachlorophene, followed by rinsing in tap water. The fourth series (20 tubes) was treated in the same manner, except for the soap, which was changed to an antiseptic soap with a hexachlorophene content of 3%.

As an integral part of this investigation, cultures were obtained from the nose and throat of all patients studied on arrival in the operating room before any instrumentation was performed.

There were 41 patients in this study, subjected to various operations. Seventeen were subjected to superficial operations on the head and neck, 12 intra-abdominal, 2 thoracic, and 10 intraoral. Follow-up examinations were done for elevated temperature and/or respiratory complications for three days after operation. Two months after the end of the study, all but 7 of the 41 charts were reviewed for evidence of later bacteriological infections.

Results

Of the 41 pairs of endotracheal tubes prepared with the soap containing 0.6-0.8% concentrations of hexachlorophene, only 18 controls, or less than 50%, were sterile. Five of the remaining 23 tubes were contaminated with various nonpathogenic bacteria, and 16 showed various degrees of contamination with staphylococci, streptococci, or both. Only two of these endotracheal tubes were positive for Staphylococcus pyogenes var. aureus.

Of the 20 endotracheal tubes prepared with soap containing a 3% concentration of hexachlorophene, 12 showed no growth, 4 showed Staph. pyogenes var. albus and an antitratum species,[1] and 4 were contaminated in transit to the laboratory (these also showed an antitratum species). (These tubes were prepared in sets of four per day.) The cultures from bottles of 5% solutions of hexylcaine were uniformly sterile.

The nose and throat cultures obtained prior to anesthetization from the 41 patients showed a variety of flora, as would be expected. Eighteen of these patients had a nose or throat culture positive for Staph. pyogenes var. aureus. Eleven of these 18 patients had been admitted to the hospital the afternoon before operation; only 4 patients had been in the hospital for more than two days prior to operation. In addition, one patient showed Klebsiella pneumoniae and four had beta-hemolytic streptococci in the nose or throat. The remainder showed the usual nose and throat flora. Both of the above noted cultures which were positive for Staph. pyogenes var. aureus in the control were used (fortuitously) in intubation of patients whose nose or throat culture contained this organism prior to anesthetization.

Cultures obtained after extubation from the 18 tubes which gave negative findings before use showed a variety of contamination. Except for two contaminations with Proteus species and Aerobacter aerogenes, the organisms found on the extubated tubes had occurred in either the nose or throat of the patients before intubation, as shown by our preinduction cultures, including six instances of contamination with Staph. pyogenes var. aureus.

The bacteriology department records show that only two patients had subsequent bacteriological study; one was for septicemia occurring three months later in a chronically ill, terminal patient, and the other was for a perineal abscess occurring two weeks after surgery. A stitch abscess, not cultured, occurred in one patient.

Eleven patients complained of sore throat or hoarseness which lasted up to two days. Two of the seriously ill patients had minor pulmonary problems in the postoperative period. There were no fatalities in this series. Thus, there was an incidence of wound infection of approximately 5% (2 out of 41) in this series, which is the same as the over-all incidence reported for this hospital in a study of all postoperative wound infections.[1A]

Comment

This hospital, in common with many others, has experienced an increase in the number of antibiotic-resistant infections. The possibility that the endotracheal tube is a source of these infections has been studied in the program initiated to determine the magnitude of the problem and the possible sources of contamination.

Anesthetization equipment has previously been studied from a bacteriological standpoint, but only one report has made note of the endotracheal tube and none has considered this equipment as a potential source of these infections. McDonald and co-workers [2] deliberately contaminated tubes and masks with sputa and known cultures of organisms and then cultured them after washing with five methods: control (no washing), Ivory soap, hexachlorophene soaps (Gamophen and pHisoHex), and green soap. Of these "only pHisoHex produced consistently sterile tubes and masks." Gross [3] found that a five-minute scrub with tincture of benzalkonium (Zephiran) chloride would result in almost complete disappearance of organisms from rebreathing tubes, tracheal catheters, and airways.

Ziegler and Jacoby [4] found the gas machine parts to be heavily contaminated with saprophytes but concluded that transmission of organisms from patient to machine or vice versa was unlikely to occur. Adriani and Rovenstine [5] in 1941 found that organisms were efficiently killed by passage through the soda lime canister. However, Livingstone and associates [6] in 1951 reported one-third of 39 face masks removed from patients with active pulmonary tuberculosis to contain viable tubercle bacilli. This incidence was reduced to 15% by simple washing.

Joseph [7] in 1952 showed the value of the 3% concentration of hexachlorophene in controlling the bacterial count of the rebreathing tubes and bags of anesthetization machines. Pathogenic bacteria were not common, although the incidence is not mentioned in the 18 cases studied.

In our initial experiments, the chimney Y and inspiratory and expiratory tubing were cultured with a swab technique but few organisms were obtained and these were commonly occurring airborne saprophytes. This phase of the experiment was therefore discontinued, and attention was focused on the endotracheal tube.

It is desirable, of course, that any mechanical devices introduced into the patient be sterile. However, the method used to produce this should be simple, reasonably rapid, and without the hazard of chemical irritation which exists when the endotracheal tubes are soaked in certain antiseptics. These requirements are met, with material already on hand in the operating room, by scrubbing with a brush for one minute with an antiseptic soap containing a 3% concentration of hexachlorophene, but not with regularity if the soap contains only 0.6-0.8% concentrations. The topical anesthetic hexylcaine used in this hospital does not serve as a source of extraneous bacteria when administered transtracheally via a sterile syringe and needle.

Staph. pyogenes var. aureus was cultured from the nose and/or throat of 50% (21 of 41) of the patients on arrival in the operating room, along with a variety of other flora, usually after only a one-day stay in the hospital. All organisms cultured from the sterile endotracheal tubes after removal from the patient had been cultured from the nose or throat of the patient before induction of anesthesia. Thus, we have introduced no new bacteria into the patient. However, the possibility exists that a path is provided by the endotracheal tube for the migration of these bacteria from the mouth to the trachea during anesthesia.

Summary

Adequate sterilization of endotracheal tubes can be obtained by scrubbing them with an antiseptic soap containing a 3% concentration of hexachlorophene. Scrubbing with an antiseptic soap containing 0.6 to 0.8% concentrations will produce sterility less than half the time. The 5% solution of hexylcaine (Cyclaine) hydrochloride used for topical anesthesia does not support the growth of bacteria.

In this series, there was a 50% incidence of Staphylococcus pyogenes var. aureus in the nose or throat of patients on arrival in the operating room. Postintubation cultures of the endotracheal tube revealed a variety of flora, all of which were present in the nose and throat of the patient before intubation. Endotracheal intubation with adequately sterilized endotracheal tubes is not a source of nosocomial staphylococcic infections. Endotracheal tubes provide no new organism when washed as described but may permit migration of the oral flora into the trachea.

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Miss Anne Blevins supplied technical assistance in this study.

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TOPICAL USE OF NITROFURAZONE (FURACIN) FOR BACTERIAL DERMATITIDES

EFFECTIVENESS OF THERAPY AND INCIDENCE OF HYPERSENSITIVITY REACTIONS

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Although the topical application of preparations containing nitrofurazone (Furacin) (5-nitro-2-furaldehyde semicarbazone) has been established to be highly effective in the therapy of various bacterial infections of the skin, many dermatologists believe that use of such preparations is attended by a prohibitive rate of hypersensitivity reactions.

Recently our interest in topical therapy with nitrofurazone was rekindled when the application of this substance to chronic leg ulcers, previously resistant to many types of treatment, was attended by marked clearing of the infection and healing of the ulcerations without any adverse reaction. With the stimulus of this clinical situation, an orderly investigation of the efficacy and reactivity of topical treatment with nitrofurazone in a group of dermatological patients was undertaken.

Nitrofurazone is a yellow crystalline compound which decomposes at 227 C and darkens slowly on exposure to light. It is bactericidal in vitro for many bacteria, including the majority of those found in surface infections; its antibacterial spectrum encompasses many gram-negative as well as gram-positive organisms; it is not fungistatic.[1]

Procedure and Evaluation

Three types of preparations used in this clinical study were nitrofurazone soluble dressing, nitrofurazone solution, and an experimental preparation, nitrofurazone cream, with nitrofurazone in an aqueous base containing glycerin, cetyl alcohol, stearic acid, mineral oil, sodium lauryl sulfoacetate, methylparaben, and propylparaben. All three preparations contain 0.2% of nitrofurazone. The soluble dressing and the cream were applied directly to the lesions three times daily, while the solution was usually diluted with one to four parts of water and applied in the form of wet dressings for one hour at a time, three times daily.

These medicaments were used to treat or prevent cutaneous bacterial infections in a total of 212 patients, including private office patients and dispensary patients of the University of Cincinnati dermatological clinics and the Cincinnati Health Department.

The manufacturer [2] of the topical nitrofurazone preparations suggests that these medicaments be applied for only five to seven consecutive days, as it is felt that more prolonged application is usually unnecessary in acute cutaneous bacterial infections and that hypersensitivity reactions are less apt to occur if the medicaments are used for a few days only. These recommendations were followed in this investigation in most cases of acute infections such as impetigo, but the medicaments were applied deliberately for much longer periods of time in many of the patients.

Bacteriological cultures were made from the lesions of 28 patients in this investigation, resulting in isolation of 21 strains of hemolytic Staphylococcus (Micrococcus) pyogenes var. aureus and 2 of Proteus species; five of the cultures were sterile.

Clinical results were classified as (1) satisfactory—infection eradicated in an efficient manner, in the judgment of the clinician, or (when used postoperatively after electrosurgery or dermabrasion of acne scars) infection forestalled without evidence of interference with healing or of hypersensitivity reactions; (2) unsatisfactory—infection not controlled or eradicated in appropriate period of time in the judgment of the clinician; (3) equivocal—not possible to evaluate effect on an infection or lesion; and (4) hypersensitivity or primary irritation reaction.

Clinical Results and Comment

The table shows the results of treatment of the various conditions studied in our 212 patients with each nitrofurazone preparation. As indicated, the majority of patients treated had impetigo or pyoderma. The results of treatment with the cream appeared somewhat better than with the soluble dressing, although the number of patients involved is not statistically significant. In the 92 patients with impetigo and pyoderma (where treatment was usually necessary for only several days or one week at most), there was only one case of hypersensitivity reaction to the cream and none to soluble dress-

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ing. Of the remaining six reactions, two occurred with use of the cream after dermal electrosurgery and two after application of the cream to infected stasis ulcers. There was one reaction to the soluble dressing in a patient with furunculosis. In the foregoing six patients, the reactions occurred only after somewhat prolonged application of one to several weeks in each instance. The seventh reaction occurred from the application of soluble dressing

Effect of Topical Application of Nitrofurazone in Dermatoses

Diagnosis	Patients, No.	Satisfactory	Unsatisfactory	Equivocal	Reaction
Nitrofurazone Soluble Dressing					
Impetigo	23	18	3	2	..
Pyoderma	15	14	1	..	..
Eczema (infected)	..	..	..	..	..
Dermatitis	9	6	1	2	..
Removal site	18	18	..	..	..
Sycosis vulgaris barbae	4	3	1	..	..
Furunculosis	5	4	1	..	2
Post dermabrasion	3	2	1	..	1
Infected atopic dermatitis	1	1	..	..	..
Scleroderma with ulcer	1	..	1	..	..
Total	79	66(83.5%)	9(11.4%)	4(5.1%)	2(2.5%)
Nitrofurazone Cream					
Impetigo	30	29	1	..	..
Pyoderma	24	21	1	2	1
Eczema (infected)	..	..	..	..	..
Dermatitis	8	6	..	2	..
Removal site	25	23	2	..	2
Folliculitis	15	13	2	..	..
Acne, pustular	8	5	1	2	..
Stasis ulcer	3	1	2	..	2
Infected sebaceous cyst	3	3	..	2	..
Pityriasis simplex (facie)	2	..	..	2	6
Ecthyma	2	2	..	..	..
Furunculosis	2	1	1	..	..
Eczema (nummular)	2	..	2	..	..
Acrodermatitis enteropathica	1	..	1	..	..
External otitis	1	..	1	..	..
Pustular psoriasis	1	..	..	1	..
Herpes zoster	1	..	..	1	..
Total	128	104(81.2%)	14(10.9%)	10(7.9%)	5(4%)
Nitrofurazone Solution					
Infected stasis ulcer	2	2	..	..	..
Infected stasis dermatitis	1	..	..	1	..
Erythema multiforme bullosum	1	1	..	..	..
Monilial stomatitis	1	..	1	..	..
Total	5	3	1	1	..
Grand total	212(100%)	173(81.6%)	24(11.3%)	15(7.1%)	7(3.3%)

* Positive patch tests with 0.2% solution and cream. Negative patch tests with cream base and polyethylene glycol.

postoperatively after dermabrasion of acne scars and was observed after only two days' treatment. Patch tests in four of the seven patients confirmed that the reactions were due to nitrofurazone.

Our clinical observations with nitrofurazone soluble dressing, cream, and solution in a group of 212 dermatological patients indicate that these medicaments are effective topical antibacterial agents. Hypersensitivity reactions, for the most part, appear to occur after use of nitrofurazone in lesions overlying a large, active vascular bed (as in stasis ulcers and acne scar removal sites), especially if the medicaments are applied for longer than the recommended five-to-seven-day period. In this connection it should be pointed out that cutaneous absorption and hypersensitivity reactions to topical preparations of almost any type are more prone to occur where the medicaments are applied to abraded areas that overlie such highly vascular sites.

It seems probable that dermatologists may have a somewhat biased concept regarding the incidence of hypersensitivity reactions to topical treatment with nitrofurazone, inasmuch as we are usually called to attend precisely those patients who do exhibit such reactions. Naturally, we do not see the much larger group of patients who do not experience reactions from such treatment and for whom these medicaments are prescribed in almost routine fashion, especially in industrial plants and clinics. It may be of some significance that, although more topical preparations of nitrofurazone were used in 1956 and again in 1957 than ever before, and incidental mentions of nitrofurazone in the clinical literature increased accordingly, relatively few current reports mention the sensitizing tendency of the drug.

Summary

Three different preparations containing nitrofurazone (Furacin) were used topically to treat or prevent bacterial infections in 212 dermatological patients. The clinical results were considered satisfactory in 173 (81.6%) of these, unsatisfactory in 24 (11.3%), and equivocal in 15 (7.1%). Hypersensitivity reactions were observed in only 7 (3.3%) of 212 patients, being confirmed by positive patch tests in 4 of these. Of the seven reactions, six occurred after applications of nitrofurazone had been made over large underlying vascular beds, and usually for a longer period of time than recommended by the manufacturer. Dermatologists' views of the incidence of allergic reactions to topical therapy with nitrofurazone may need revision downward, particularly if such therapy is limited to seven days or less and not applied on surfaces overlying a large vascular bed.

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COUNCIL ON NATIONAL DEFENSE

WELCOME ADDRESS

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The following papers were presented at the Ninth County Medical Societies Civil Defense Conference held in Chicago, Nov. 8-9, 1958. This annual conference is sponsored by the Council on National Defense of the American Medical Association.

These conferences are planned to inform and otherwise assist medical and health personnel for their respective roles in disasters. Conferees have the opportunity (1) to participate in workshop sessions concerning medical preparedness to cope with disasters, (2) to discuss and exchange information dealing with emergency medical services, (3) to be informed on the availability of pamphlets and articles devoted to the medical and health aspects of civil defense, and (4) to hear outstanding speakers report on appropriate civil defense and disaster topics.

FRANK W. BARTON, Secretary.

As Chairman of the Council on National Defense, I want to add the greetings of our Council to my personal good wishes to all of you attending this conference. The program indicates that the sessions will be most interesting and informative. I congratulate the program committee for obtaining such an array of outstanding speakers to discuss timely and important phases of emergency medical preparedness.

We are particularly pleased that Governor Leo A. Hoegh and members of his staff from the Office of Civil and Defense Mobilization are participating in the program. We are honored to have these distinguished guests. A number of important changes have been made recently in civil defense at the federal government level and I am sure that Governor Hoegh is going to outline these developments for you.

In looking over the program I see that the speakers come from 14 states and the District of Columbia. With but one or two exceptions, I know all of them personally. Most of them are physicians. All of them are dedicated persons—dedicated to promoting medical civil defense preparedness among their colleagues and others in the medical and health field. This is evidence that we have physician leaders in many states who are devoting a great deal of their attention and time to medical civil defense preparedness. It should encourage each of us to return to our own cities and communities and do likewise. Indeed, to meet our responsibilities as physicians, we must expand medical civil defense preparedness to include all members of the medical and health professions in every community.

Chairman, Council on National Defense, American Medical Association.

In sponsoring these yearly County Medical Societies Civil Defense Conferences, the American Medical Association, through the Council on National Defense, wants to encourage the medical profession to participate, individually and collectively, in medical civil defense affairs. This is in keeping with the purposes and objectives of the A. M. A.

In anticipation of the possibility of the United States becoming involved in World War II, more than a year before the Japanese attack on Pearl Harbor the A. M. A. established a Committee on Medical Preparedness. This Committee built up a roster of all physicians in the United States with information as to their special qualifications, their responsibilities in civilian medical practice, and their availability for possible military service. This Committee also recommended the establishment of the Procurement and Assignment Service for Physicians and Dentists to plan for the recruitment of a sufficient number of physicians to meet the needs of the military services with the least possible disruption of essential civilian medical services. It was my privilege to serve as a member of the Directory Board of this Service. Then, in December, 1945, immediately after the termination of World War II, the A. M. A. Board of Trustees established a special committee to study what we today call civil defense. That was five years before the United States had a Federal Civil Defense Program. Dr. Hungate, who is on the program of this meeting, will discuss some of the specific activities and objectives of our Council on National Defense and its Committee on Civil Defense. Therefore, I will not comment on the work or the programs of our Council except to say that we are deeply interested in medical civil defense affairs.

It is not enough, of course, that we are interested. We must interest others. That is one of the profession's responsibilities. Tomorrow the Association's President, Dr. Gunnar Gundersen, will speak about these responsibilities.

I noted with considerable satisfaction that one of the features of the program this year will be reports on the experience gained from three civilian defense test exercises. Such exercises are invaluable to test medical plans and preparations for meeting disasters. Sometimes, also, a real disaster may put these to a test. You recall, I am sure, how the people of Lake Charles, La., were put to the test by hurricane Audrey in 1957. Fortunately, in the communities most severely struck by this hurricane civil defense was well organized and disaster plans well developed. The thousands of hours which civil defense workers of these communities devoted to preparation were invaluable in providing the survivors of hurricane Audrey with essential emergency medical services. However, even with the fine planning and the heroic actions in this natural disaster, much was learned from this experience that will improve their civil defense performance for a possible future emergency. Among other things learned from this experience were that a special civil defense short-wave radio channel was needed, as were more nurses in the civil defense organization, better transportation liaison, less overlap in command, and battalion aid station chests in hospitals to supplement the 200-bed civil defense emergency hospital. Incidentally, this 200-bed emergency hospital unit was put to actual use for the first time in the Lake Charles disaster. Even without the catastrophe of another world war, local physicians may be called upon at any time to provide emergency services such as those which saved many lives in the Lake Charles area. For such emergencies, as well as for the possibility of war, we must be ready.

THE AMERICAN MEDICAL ASSOCIATION CIVIL DEFENSE PROGRAM

Carroll P. Hungate, M.D., Kansas City, Mo.

The Civil Defense Committee of the Council on National Defense directs its activity toward the following specific objectives and projects: The Committee sponsors a one-day session on civil defense and related problems on the Saturday preceding the Annual Meeting of the American Medical Association and a two-day session on civil defense and related problems, annually, in the fall, for county medical societies. It prepares permanent reports of sponsored meetings for state medical associations, county medical societies, and those attending such sessions.

The Committee accomplishes the necessary research for testimony before congressional committees concerned with civil defense. It acts in a liaison capacity between the A. M. A. and national organizations concerned with disaster preparedness. On request, it recommends physicians for membership on advisory committees, private or federal, concerned with civil defense and disaster preparedness. Resolutions are prepared by the Committee for submission to the A. M. A. Board of Trustees concerning matters pertaining to disaster preparedness which require action by organized medicine. The Committee is the contractural agency with federal agencies, on request, for special study projects. It provides a continuous educational program related to disaster preparedness, and, during special civil defense and disaster exercises, it participates in the evaluation of medical disaster planning, equipment, and supplies.

The Committee meets periodically (at least semiannually) in each region in the United States with representatives of state medical associations and women's auxiliaries to these associations. Educational material is prepared by it for state medical associations. It discovers physicians with capability in disaster planning and provides them with an opportunity for national recognition through dissemination of their special work. Finally, it arranges for attendance of members of the medical profession at testing of nuclear weapons in Nevada.

The one-day session on civil defense and related problems, held prior to the Annual Meeting of the A. M. A., brings together the best minds in America for the education of the medical profession. For example, the 1957 session in New York was a milestone in the dissemination of knowledge in the field

Member, Council on National Defense and Committee on Civil Defense, American Medical Association.

of radiation effects. The county medical society conferences are directed toward the workshop type of meeting where specific problems are considered and an attempt made to solve them. Reports of meetings sponsored by the A. M. A. are prepared by the secretaries of the Council as reference guides for the physicians of the United States and Canada.

In recent years, several committees of Congress have been concerned with civil defense and its budgeting. Testimony by representatives of the American Medical Association requires careful preparation. The influence of organized medicine has been effective in guiding the development of civil defense planning regardless of the political complexion of Washington. In most instances the advice and counsel of the A. M. A. is not only sought but carried out. The present status of the Health Section of OCDM is the result of constant emphasis by the Board of Trustees on the importance of that office.

The A. M. A., through the Civil Defense Committee of the Council on National Defense, has carried on a continuing disaster educational program. Numerous articles on this subject matter have appeared in THE JOURNAL. State medical associations have been urged to issue special editions of their state journals devoted to civil defense and to provide at their annual sessions, as a part of the scientific program, lectures or panel discussions on civil defense and disaster. The A. M. A. has encouraged the activity of state civil defense and disaster committees and has recommended that state medical associations include in their annual budgets funds for the expansion of their civil defense program. This budget should provide for travel expenses of state association members to national civil defense and disaster meetings sponsored by the A. M. A. We have recommended that hospital staffs devote one meeting a year to the subject of disaster planning and organization.

The American Medical Association has encouraged special evaluation exercises, such as those held at Fort Mead, Md., and at the Brooke General Hospital, to test the adequacy of civil defense equipment and supplies. The A. M. A. observers have been on hand at special university medical school disaster exercises. Participants in such exercises or those with actual disaster experience have appeared on programs sponsored by the American Medical Association in order to provide first-hand practical data for the profession.

In a liaison role, the A. M. A. has stimulated national associations and societies to appoint civil defense committees at each echelon of their organization and to encourage training of their membership. The inclusion of disaster plans and exercises as a part of hospital accreditation is the result of the initial recommendations of the A. M. A.

In the past year there has been an innovation in the relationship of the Committee on Civil Defense of the Council on National Defense and its state counterparts. The A. M. A. committee has been meeting in the various OCDM regions of the United States. This has brought to the grass roots areas a close association with the parent organization, thus giving a feeling to the A. M. A. membership that we do not sit in an ivory tower.

The success of disaster planning and operation requires the continual infusion of new faces into the program. From time to time, on our trips about the United States, new talent is discovered. These physicians are encouraged to present their thoughts to the profession at large at one of our annually sponsored meetings. Of course their subject matter and manner of presentation must be of the caliber to merit such recognition.

The A. M. A. has used its influence with the Civil Defense Administration and the Atomic Energy Commission to permit physicians and ancillary personnel to attend and actively participate in the medical aspects of nuclear weapons testing at Yucca and Frenchmen's Flats in Nevada. These experiences result in a better understanding of the medical problems associated with modern warfare. They also act as an incentive for greater effort, perseverance, and action by physicians on return to their home towns.

An educational program does not always produce immediate or startling tangible results. The activities of the profession in the field of disaster preparedness has, however, produced a revolution in the United States. Civil defense activity is everywhere. Our population is aware of the Communist threat whether they face up to the realities of the day or not. Progress is made year by year in the proper approach to natural and man-made disasters. Changes in federal and state laws and local ordinances are evidence of the fact. Improved techniques in the management of disasters are seen everywhere.

To properly handle the medical effects of nuclear weapons was, long ago, recognized as the greatest organizational challenge to American medicine in the 20th century. We are meeting this challenge, and our results are reflected in the better handling of natural disasters and new awareness of the effects of radiation in industry, medicine, and research and from atomic sources. The responsibilities imposed upon the medical profession in the atomic age are being met by all of us.

THE FEDERAL CIVIL DEFENSE PROGRAM—OCDM

Leo A. Hoegh, Washington, D. C.

The fact that you are here today is clear evidence that you are dedicated to the proposition that America must live. The challenge that is before all of us, in this hazardous age, is to make certain that our nation and its people survive any disaster that might be directed against us.

It is good to know that you are as deeply interested as I am in the problems of the nuclear age. I know of no group, no profession, that is more dedicated to the cause of civil defense than are you and all the other members of the American Medical Association.

It is a good thing for all of us that you are. It is with you, and all others so strategically situated, that our civil defense effort will succeed or fail. I am sure that you mean to make it succeed.

We at the national level of civil defense and defense mobilization can make all kinds of plans and plan all kinds of actions. Nevertheless, it is you at the local level of civil defense who will be the decisive factor if we are ever attacked.

Your service does not wait until that critical moment, however. Medical societies in all of the nation's communities have long been among the leaders of local planning for civil defense. You have provided strong leadership in planning, organizing, and educating our people. People have a confidence in you that is a priceless asset. We need all of the confidence we can get as we deal with the many intangibles that go to make up a real civil defense.

Militarily, today, we are stronger than we have been in our whole history. We have excellent defensive capabilities, and we have tremendous retaliatory striking power. To make us as strong as we should be, however, we need to match this with an equally strong nonmilitary defense.

If we ever are attacked, it seems quite clear that our cities, our industrial establishments, and our military and atomic energy installations will be battlegrounds. Hence, we must create a total ability to survive, recover, and win such a conflict.

I am not predicting that such an attack will occur. I do not expect one. I do know, and I believe you will agree, that so long as nuclear weapons and fast delivery systems exist in Russian hands such an attack is possible. We must never say "it can't happen here," because history records too many wars that were started by fanatics or zealots. In this age it would be much too easy to push the wrong button.

America must live. It has been the hope of oppressed mankind for 180 years, and it remains today as the shining dream for millions. To live, we must be strong. In creating the kind of strength we must have, it is entirely possible that we could prevent an attack from ever occurring.

Strength is always a deterrent. Even the foolish would hesitate to attack a nation that is prepared to survive and recover.

Where do we find this strength? It can come from the only two elements that are basic to an adequate civil defense: government and people. This is not new to you. It long has been clear that government at all levels must be prepared to maintain control and to direct action in any emergency situation. It is equally clear that the effects of nuclear weapons, such as the possibility of extensive radioactive fall-out, virtually demand that individuals must be prepared to protect themselves and their families, for as much as two weeks, entirely without help from the outside.

A year ago, Mr. Lewis E. Berry, then deputy administrator in the Federal Civil Defense Administration, discussed these responsibilities with you here at some length. Nothing that is basic has changed, but in this year there have been quite a number of developments which are putting real strength in the nation's nonmilitary defense, and it is these developments that I will now discuss.

New Developments

The National Plan.—Two weeks ago we began the distribution of the National Plan for Civil Defense and Defense Mobilization. With a promulgation signed by President Eisenhower, the plan establishes national nonmilitary courses of action both to deter aggression and for national survival in the event of attack.

The plan sets forth the specific mission of each level of government—federal, state, and local—for professional organizations and for the individual citizen. All of the basic civil defense principles and responsibilities for protecting life and property are clearly set forth in this one document.

It creates a civil defense channel of coordination down which instructions will be transmitted and up which requests for assistance will be made. It states our mission clearly: "To protect life and property from the effects of attack by preparing for and by carrying out emergency functions to prevent, minimize, and repair injury and damage," and the mobilization of resources and production. It sets forth the functions and, step by step, how the mission is to be accomplished and by whom.

Director, Office of Civil and Defense Mobilization.

Simultaneously we have been issuing a "Summary of Annexes" so that all who have responsibilities under the plan will know in just which forthcoming annex the details of his own mission will be spelled out. These annexes are being prepared right now, and we expect to issue them as rapidly as each is completed and approved by all concerned.

A number of them will be of interest to you, particularly the National Medical and Health Plan, which will be Annex 18. This is the responsibility of the U. S. Public Health Service, by delegation to the Department of Health, Education, and Welfare. You will be interested to know, I am sure, that Dr. Robert Leslie Smith, who has been assistant administrator for Health and Medical Affairs of FCDA, now has been recalled by the Public Health Service to have a direct responsibility for carrying out the delegated functions.

Other annexes that you will find of interest include the National Radiological Defense Plan, the National Biological and Chemical Warfare Defense Plan, the National Food Plan, and Mass Care and Assistance. In all, there will be 40 annexes, covering in detail all aspects of civil defense and defense mobilization—in short, the nation's passive or nonmilitary defense.

Reorganization Plan No. 1.—Such a comprehensive document could not have been issued six months ago. Necessary to its perfection was congressional approval of President Eisenhower's Reorganization Plan No. 1 of 1958, which became effective last July 1.

This plan merged the Federal Civil Defense Administration and the Office of Defense Mobilization as the Office of Civil and Defense Mobilization in the executive office of the President.

By the President's executive order putting this into effect, all of the nonmilitary responsibilities of the federal government were laid directly in the hands of the President, who thus takes direct charge of the nation's total defenses. He has delegated to me those responsibilities that lie outside the military area.

This has been a tremendously important step for the cause of civil defense and defense mobilization. It has given great new strength and stature, a proper standing in the federal government, to the mission for which we must answer to the President.

Public Law 606.—In a different direction, Congress took another action to strengthen civil defense when it unanimously passed H. R. 7576, which now is known as Public Law 606. This alters the whole federal-state relationship and changes a completely outmoded concept under which Congress held for eight years that civil defense was primarily the responsibility of the states and their political subdivisions.

Now the basic law under which we operate forthrightly declares that civil defense is a joint federal-state-local responsibility. It gives meaning to that relationship when it authorizes us at the federal level to help the states and cities with their administrative and personnel costs. It also authorizes us to help pay training and personal equipment costs at these levels and a large program for the purchase and distribution of radiological measuring instruments.

It is my hope that, early in the new year, we will have Public Law 606 in effective operation, thus putting new sinews in state and local organizations. Passage of the act came so late in the last session of Congress that there was insufficient time to obtain the funds that it authorized, but congressional leaders have invited me to return in January to ask for the needed funds.

The National Shelter Policy.—As medical men, you will be interested to know, too, that I intend at the same time to ask for funds to put into effect the National Shelter Policy adopted by the Administration last May. This policy sets forth five courses of action, which I will review briefly: 1. Intensive education of every American on the possible effects of nuclear attack and the actions he and his government can take to minimize them. This means a sharp stepping up of our educational and informational programs. 2. Making surveys of existing structures to determine their shelter capabilities and what must be done to bring them to standard. 3. Accelerating research to show how shelter may best be incorporated in both existing and new structures, to improve shelter designs, and to reduce costs. 4. Construction of a limited number of prototype shelters for varied geographical and climatic areas, insuring that they have practical peacetime use as well. 5. Setting federal example by incorporating fall-out shelters in federal buildings hereafter designed, as in indispensable stimulation of state and local governments and to private investment. I have issued a general order to all federal departments and agencies to make this provision effective. In addition to these new developments of the last year, there are three continuing programs on which we are putting more and more emphasis.

Continuing Programs

Continuity of Government.—Government must continue without interruption, and with full force and effect, under any conceivable emergency. The survival of the nation in no small measure depends upon the ability of federal, state, and local governments to carry out their responsibilities in the event of nuclear attack.

To be certain of the ability to continue functioning, all governments must take these four steps: (1) establish automatic lines of succession for all key officials, appointed or elected, and covering all branches of government–legislative, executive, and judicial; (2) preserve, and hold at alternate sites, all of those records necessary for the orderly operation of government and for the protection of individual rights; (3) establish emergency locations from which the governments of states, counties, and cities can continue to function under adverse conditions; and (4) provide for the emergency use of all government personnel, facilities, and equipment.

This program has the support of governments at all levels, and legislation and constitutional amendments to make it effective will be before 44 state legislatures that are convening in January.

Radiologic Defense.–Since radioactive fall-out from a nuclear attack could become a nationwide problem, we are working as rapidly as possible to develop a nationwide capability of detecting and measuring radiation. We are taking four actions simultaneously: We are providing instruments and training to state and local civil defense officials. We are providing both instruments and training for the personnel of 900 federal aviation agency and weather bureau stations, giving us fixed monitoring capability. We are providing kits of training and monitoring instruments this year to 15,000 high schools, or about half of the nation's total. We expect to provide them for the other half in the next two years and, as a result, to train about 2 million students a year. Through schools and traveling teams, we are training science teachers and other instructors who, in turn, can teach many more individuals in this most important service which someday might be needed at almost every community in the nation.

Survival Planning.–Operational survival plans have been completed in 38 states and many metropolitan target areas, and work is being pushed to complete the rest of a total of 195 plans by Jan. 1, 1959. When these are finished, the states will have detailed operational plans to deal with emergency situations. These plans will cover more than 97% of the population.

All of these plans will be completely linked to the National Plan for Civil Defense and Defense Mobilization. Together, they will give solid substance to our nonmilitary defense from a governmental standpoint.

Comment

I realize that, as deeply interested in civil defense as you are, you very well may be aware of all of these developments of the last 12 months, but I felt that a review of them would be in order, especially as they relate to each other to form the substance of our over-all program.

We must keep firmly in mind, at all times, that it takes more than government to create a strong civil defense. Equally important are people and their own personal preparations to survive. This is basic. So much of the country could be affected by a nuclear attack that no one would be able to help anyone else.

That is why we say that every American must know these five things: warning signals and what they mean; your own community plan for emergency action, protection from radioactive fall-out, first aid and home emergency preparedness, and the use of Conelrad–640 or 1240 on your radio dial–for official directions.

These are the minimum requirements on the individual, with whom all civil defense would start if the United States suffered an attack. The national plan clearly sets forth that individuals and families will be expected to exist on personal stocks of survival items in homes and shelter areas for two weeks. They must prepare their own shelter from fall-out radiation. It is in this area of personal preparation that we must devote intensive educational effort, and we are going to do it.

Conclusions

For a long time, a severe handicap to the development of an effective civil defense has been represented by the two comments, "It can't happen here," or, "If it does happen, there's nothing we can do about it." We know it can happen–as long as nuclear weapons and fast delivery systems exist. Now we also know what can be done about the threat. Our plans and programs are sound. They will enable the United States to survive an attack, to recover, and to go on to win.

The pessimist, the defeatist, the cynic can always present the dramatic. For instance, a recent report states that in case of a nuclear attack there would be 160 million casualties. Nothing could be further from the truth than such a statement.

The report is based on three false assumptions: (1) that everyone is outside and will remain outside for two weeks, (2) that there is no civil defense capability, and (3) that the enemy is free to hit all probable targets. Such a report contributes to the philosophy that "nothing can be done about it."

The people of the United States have always had a fierce will to win and to remain free and independent. With the help and leadership of such dedicated men as you here, I feel certain that we can guide that spirit into the cooperative work of creating a civil defense that is worthy of the United States, which has never settled for anything less than the best.

NATIONAL MEDICAL PREPAREDNESS

W. Palmer Dearing, M.D., Washington, D. C.

President Eisenhower, in addressing the National Defense Executive Reserve Conference last November, said that planning is everything but when the emergency actually occurs plans go out the window. "The definition of 'emergency,'" he said, "is that it is unexpected, therefore, it is not going to happen the way you are planning."

This paradox was startling to some of us who have devoted our energies to mobilization and civil defense planning. Webster defines a paradox as "an assertion or sentiment seemingly contradictory, or opposed to common sense, but that yet may be true in fact." As we continue to try to do our part to help achieve the posture of total defense which Lewis Berry spoke to you about a year ago, we appreciate more and more the cogency of the President's paradox.

It expresses on the one hand the virtue and indeed the necessity for undergoing the planning process—not once, not twice, but continually—to develop the means, the organization, the state of mind, and habits of thought and action which are essential to effective performance. On the other hand, it expresses the fallacy of becoming wedded to static plans which are sure to become outdated and hampering. A real situation will never conform to the assumptions on which our best plans are based.

In discussing national preparedness, I should like to stress the importance of our state of mind—our habits of thought. I should like also to report some developments which should enable us to carry forward better the serious work to which you have so long been dedicated—the work of planning, training, and organizing for the total defense of the United States.

Education and Training Problem

The importance of state of mind is illustrated by a story which Dr. Elmer Hess, chairman of the Health Resources Advisory Committee, tells of a conversation with his barber. This man, described by Dr. Hess as having considerable intelligence, was voicing the fatalism which many of our fellow citizens adopt as an excuse for inaction and lack of interest in civil defense. He said that if a bomb hits, that is it! Dr. Hess inquired where he lived, and he stated that his home was some 35 miles outside of Erie, Pa. When Dr. Hess pointed out that if a bomb struck Erie, his family could very well be saved if they had made some simple preparations, the barber asked, "Why doesn't the government tell us these things?" Well, of course, the government has been trying to "tell us these things," but education is a slow continuing process in which we must all participate.

The awesomeness of modern weapons so overwhelms us that we tend to concentrate on their destructiveness. We would better follow the principle which has proved so effective in rehabilitation of the injured individual: concentrate on what you have left and not on what you have lost. Of course, there will be losses, but surviving resources—people, doctors, supplies, crops, raw materials, and productivity—are the things on which we must concentrate. Further, let us keep reminding ourselves that it is preparation of our people and our profession for survival which is, along with our preparation for military defense and retaliation, the third great deterrent to an attack.

The importance we in the Office of Civil and Defense Mobilization attach to our "state of mind" is manifest. One of Governor Leo A. Hoegh's first organizational moves after the consolidation last July was to make training and education one of the major branches of the new agency by designating one of his three assistant directors for that responsibility.

Our health professions are founded upon education. We have recognized, moreover, that health progress requires continuing education, so we welcome the impetus that this decision will give the entire health program.

To be sure, we intend that federal-level responsibility for purely technical training in the health field will be delegated, along with other operational responsibilities, to the U. S. Public Health Service. Education and training in health matters, however, must be an integral part of the general education effort.

The health professions have an important responsibility to participate in the education of the general public for disaster. We know that individuals, families, and larger population groups will be on their own for varied periods of time after a major attack. The entire population will be short of medical supplies and facilities in varying degrees. Widespread health education, including first aid and home nursing training, is a fundamental step toward survival, and we in the health professions have the teaching job to do.

Health Services Problem

Another development which denotes some progress is the trend in our thinking toward considering the health services problem in a survival situation as a unity. One manifestation of this trend is the administrative decision, with which you are quite

Director of Health Services, Office of Civil and Defense Mobilization.

familiar, to make the delegation of operational responsibility to the Public Health Service comprehensive instead of piecemeal. The advance in our thinking which I want to stress to you, however, grows largely from our annual exercise—Operation Alert 1958.

This exercise was the most successful we have had. Instead of trying to do the whole job in a week, as heretofore, we conducted the exercise in three phases: (1) the civil defense phase in May, when the states and communities tested their capabilities for taking action; (2) the federal action phase in July, when the federal agencies devoted a week to dealing with the problems which had arisen in the states as a result of the effects of the simulated attack upon the national resources and capabilities; and (3) the seminar phase in September, when the entire results were analyzed at the Cabinet level and reviewed by the President and when certain courses of action were adopted.

In the health field, we hammered out the concept of this unity of the health problem to which I have referred. Rather than thinking of the job in segments, such as casualty care, medical service to the uninjured, and environmental sanitation, we are now talking about health care of the surviving population. Rather than setting casualties apart from the uninjured population in considering priorities for health services, we are recognizing that a health problem, whether it be of personal injury or of public health hazard and whether it resulted from direct enemy action or from "natural causes," has the same effect on people.

In the course of this exercise, we have further refined the priorities which Dr. Van Sandt presented here at your conference a year ago. Here is how we presently state the priorities for health care: (1) individuals whose lives are endangered by injuries or sickness but whose chances of recovery with hospital treatment are good, with treatment confined initially to those procedures which are essential in order to save life; (2) pregnant women, with outpatient treatment for normal pregnancies and hospitalization for obstetric emergencies; (3) casualties and noncasualty sick persons whose injuries do not threaten life, with outpatient treatment only or self help; and (4) persons with cases of such gravity that extensive treatment is unlikely to save life.

I think the important thing, however, is not in the precise terms used today or next year but in the pattern of thought—the state of mind—which is trained to recognize the need for priorities and, therefore, is prepared to establish them to fit the situation that exists.

Obviously, the fragmentation of our society which would result from a massive nuclear attack upon the United States would mean that uniform national priorities could not be implemented, even if they might be desirable. The administration of survival health services, therefore, must depend on physicians and other health personnel trained to deal with these new problems of priorities and shortages and, in many cases, to advise the top governmental authority of an area of the requirements that must be imposed.

Metropolitan Area Problem

A third development of interest to the medical profession is the progress in dealing with metropolitan area problems. The metropolitan area has been a knotty problem since long before I began to wrestle with it in civil defense of World War II. Chicago-Gary, St. Louis-East St. Louis, New York City area complex, Washington, D. C.-Virginia-Maryland, and Philadelphia-Camden are well recognized interstate problems. But, a new phenomenon "urban sprawl" is plaguing every large metropolitan area, even if state lines are not involved. The assistant secretary of the Department of Health, Education, and Welfare, Elliott Richardson, in addressing the American Public Health Association last week stated that "'urban sprawl' featured by outward migration from the central city has created particularly an acute problem in the planning of hospital services." The problems of hospitals in this respect are insignificant compared to those of organizing for civil defense and mobilization. Questions of political jurisdiction, financing, and sometimes just plain old prestige and who is to be in charge are just as acute in intrastate metropolitan areas as they are when state lines are involved.

An important new tool for dealing with this problem is the provision in our civil defense amendments of 1958 for giving federal assistance directly to metropolitan area authorities as well as to states for administrative expenses of civil defense. This would include organization and equipment of health services and training of health personnel. This availability of federal assistance should provide real stimulation for the political units to get together.

This will take time, however, and there is an experience of one of you which may point the way toward medical service organization without waiting for political organization. I refer to the experience in Kansas City area as reported by Dr. Carroll Hungate. Our fire departments, almost without exception, have had long-standing arrangements for collaboration and "covering-in" across political boundaries and they have the communications to support effective operation. Dr. Hungate reports that the health services in the Kansas City area have built upon this system and have based their organization upon the metropolitan area fire department system without waiting for "treaties" between Kansas City, Kan., Kansas City, Mo., and adjacent areas.

We are proud of the professional ties in the health world which transcend political boundaries. Here is a practical application to a real situation developed by the initiative of the health profession building upon these ties.

Summary

Three developments denote progress in developing the "state of mind" which we in the health professions must acquire if we are to organize and train for the health survival job. First is the decision in the Office of Civil and Defense Mobilization to increase our emphasis on education and training. Second is our progress toward recognition of the unity of the health survival job both by making a comprehensive delegation of operational responsibility to the Public Health Service and by thinking of our job as health care of the surviving population rather than as a compartmented one. Third is our progress in dealing with the metropolitan area problem which has continued to be one of the thorniest which confronts us. We are moving ahead, and this Ninth Annual Conference of the County Medical Societies Civil Defense Organization is an important milepost.

CHEMICAL AND BIOLOGICAL WARFARE

Paul A. Lindquist, M.D., Battle Creek, Mich.

I would like to start with two definitions defining chemical warfare and biological warfare from a civil defense point of view. Chemical warfare is the intentional use of toxic chemicals to kill or confuse man. Biological warfare is the intentional use of living organisms or their toxic products to produce death, disability, or damage to man, animals, or crops. Note that both chemical and biological warfare are concerned only with living things. These two types of warfare have frequently been called unconventional warfare. They have nothing whatsoever to do with conventional weapons which cause physical destruction not only of humans but of equipment and facilities.

Nuclear and thermonuclear bombs are conventional weapons if we consider the blast and heat effects. Fall-out, however, is in a sense an unconventional weapon since it adversely affects only living things. Chemical and biological weapons or agents are far more flexible than fall-out and offer a wide spectrum of effects. In the case of chemical warfare agents, we have a whole series running from such tear gases as bromoacetophenon, through such lung irritants as phosgene and such vesicants as mustard, to the newer and highly lethal anticholinesterase agents commonly known as nerve gases.

In the field of biological warfare agents we may consider bacteria, viruses, rickettsias, protozoa, and toxins. These in turn vary greatly in their infectivity and in the resulting mortality rate. For example, Rickettsia burneti (Coxiella burnetii), the organism which produces Q fever, has a high infectivity but one would not expect many fatalities. On the other hand, the yellow fever virus and Bacillus anthracis cause a high incidence of death. Between these extremes, there are many variations. Biological warfare agents may also be delivered by different means. Aerosols may be very effective, as well as vectors.

Acting Deputy Director, Health Services, Office of Civil and Defense Mobilization.

Background

The use of chlorine as a chemical warfare agent was proposed in the early days of the Civil War for use by Northern troops against entrenched Confederate troops. It was not then practical, since the production of chlorine was extremely limited. It was not until a large chemical industry had been built up that toxic chemicals could be used effectively in sufficient quantity in combat.

At the outbreak of World War I, Germany controlled the chemical industry. It is not surprising, therefore, that on April 21, 1915, the Germans released large quantities of chlorine against unprotected allied troops. It was a surprise attack launched early in the morning under favorable meteorological conditions. It resulted in 5,000 casualties and the complete demoralization of 15,000 troops.

In first using chemical warfare agents, Germany did not actually break the Hague Agreement of 1899, since this agreement specifically limited the signatories to abstain from using toxic chemicals "in projectiles." The Germans had used static cylinders. Later the same year, the Germans used phosgene. Both of these agents are lung irritants, and eventually protection was developed through

simple gas masks. To overcome this protection, the central powers launched, in July, 1917, a mustard gas attack which circumvented the mask by penetrating through the skin. In the first three weeks, the Allies suffered 14,000 casualties and 500 deaths. It has been estimated that gas warfare alone during World War I caused 1,200,000 casualties, of which 400,000 were due to mustard.

During World War II the Germans developed another type of toxic chemical, which was neither a lung irritant nor a vesicant but an anticholinesterase agent which attacks the central nervous system. What these agents were was entirely unknown to the Allies until depots containing them were discovered by American, British, and Russian forces. These agents are today considered a possible serious threat to the United States.

Physiologically, these nerve gases inhibit the production of cholinesterase, thus permitting the unrestricted production of acetylcholine with subsequent uncontrolled muscular activity. The only acceptable therapy for nerve gas casualties is the rapid injection of atropine. In severe cases, atropine alone is ineffective and artificial respiration is essential. To illustrate the high toxicity of one of these nerve gases, I might point out that hydrogen cyanide would have to be inhaled at a concentration of 5,000 mg. per cubic meter for one minute to cause 50% casualties. On the other hand, a nerve gas would require 100 mg. per cubic meter for the same length of time to produce the same results.

Not too much is known about biological warfare agents in military operations; however, Dr. Fothergill, in *Military Medicine*, July, 1958, stated, "Infectious disease has often been the critical factor in the outcome of a military campaign." For example, bubonic plague is said to have stopped the Crusaders at the gates of Jerusalem; dysentery probably caused more casualties in Napoleon's Grand Army than enemy firearms; typhoid and the dysenteries played havoc in the Boer and Spanish American Wars; typhus prevented the Germans from carrying through their Balkan campaign in World War I; and in World War II scrub typhus caused 7,000 casualties in the southwest Pacific. In the Korean war, encephalitis B (Japanese type) and hemorrhagic fever were serious medical problems. Little can be said of the intentional use of pathogenic organisms or their toxic products; however, it may be noted that the Germans in World War I are said to have infected horses in the United States destined for the Rumanian Cavalry with glanders. In World War II, German occupation troops stationed in eastern Europe are believed to have been intentionally infected with pathogenic organisms. So much for the brief background on chemical and biological warfare.

Future Uses

What are the Russian interests in these two types of weapons? In January, 1957, Defense Minister Zhukov stated before the Communist Party Congress: "The USSR is rebuilding its Armed Forces on the basic assumption that the means and forms of future war will differ in many respects from past wars. We will see the mass use of air power, various types of missiles, and means of mass destruction like nuclear, chemical, and biological weapons."

There was an interesting article published in *Military Medicine* and *Pharmaceutical Review* (Yugoslavia) by Col. Adam Milkovich in the November-December, 1956, issue. After discussing chemical and biological warfare, the colonel states, "There is less knowledge, less talk, less writing, less thinking about them, and therefore, there is less work done in preparation of defensive measures. The main reason, however, for this is not that biological weapons have never been used in war, but that the use of them has never been detected as was the case with atomic and chemical weapons." Later the colonel states, "From results of comparative studies of losses of life from conventional weapons, war poisons and atomic weapons, on the one hand, and losses from biological weapons on the other, it is believed today that a biological war would have the greatest effect of all." In closing, he states: "Present experience has shown that no special significance would be attached to international decisions on this matter and that it is practically impossible to control either the preparation or the use of biological weapons in wartime."

Russian posters have indicated an interest in chemical and biological warfare. When one speaks of delivery of chemical or biological warfare agents in aerosol form, one usually thinks of small-area coverage. However, one poster shows the travel of a cloud of fluorescent particles released from a ship traveling some 10 miles offshore under selected meteorological conditions. (Slides of this and another poster were shown by Dr. Leroy D. Fothergill before the A. M. A. Medical Civil Defense Conference in San Francisco on June 21, 1958). The particles per liter should be multiplied by a breathing rate of 15 liters per minute to indicate the approximate total inhalated dose. However, in 1950, a somewhat smaller test was run with use of Bacillus globigii.

According to Dr. Fothergill, "A satisfactory cloud was produced even though these nozzles were only about 5% efficient in producing an initial cloud of particles in the size range of one to five microns. In this test, 130 gallons of suspension containing 7.2×10^{9} organisms per liter or a total of approximately 3.54×10^{15} spores was aerosolized." This represents a total aerosol cloud of approximately 3½ million billion spores. This aerosol was sprayed

from the rear deck of a small naval vessel cruising about two miles offshore and vertical to an on-shore breeze. Spraying continued along a two-mile course.

The maximum distance of the farthest sampling station was 23 miles from the source, and it can be seen from the isopleths that approximately 100 square miles was covered by the sampling area. Dr. Fothergill believes that it is quite likely that even a greater area was covered, particularly downwind. Samples were taken at various levels to obtain the vertical profile of the cloud. The dosages to persons breathing at a rate of 15 liters per minute for two hours were, first floor, 3,440, 9th floor, 4,500, and 15th floor, 562. It would appear, therefore, that height above the ground in most habitable buildings will not provide protection.

CALIFORNIA CPX—MEDICAL AND WELFARE SERVICES

Frank F. Schade, M.D., Los Angeles

How well can we expect our plans to function? Many methods and techniques for testing have been used in as many places across the United States from the annual Operation Alert to local tests and drills. We are all in agreement that increasing emphasis must be placed upon the capabilities and preparation of the support areas, to which the attacked cities must look for help. These areas are the least prepared to give the required support because of their very limited resources of personnel, facilities, supplies, and equipment.

Methods

A test was devised for the support areas, with two purposes in mind, based upon the premise of an assumed situation of strategic evacuation—no casualties. The first objective was to determine the total medical potential of the support areas of the southern part of the state, known as Region 1. The second was to know if there was any duplication of intention to use certain facilities, such as schools and other large buildings. Welfare is the other service that would have need of buildings and other facilities of the type required by the Medical and Health Service. It was therefore decided to have a joint exercise with Welfare Service, which would also give workers in that section an opportunity to critically appraise their capabilities, as well as provide means of determining and adjusting any conflicts between the two services.

We are interested in thoroughness and accuracy, so there was no narrowly restricted time limit, which is one of the criticisms of the usual CPX. The way it was devised, those participating got training in technical and administrative procedures as well as some actual field work. Fact sheets were prepared, outlining the objectives of the exercise and giving much basic factual information, such as normal expectancy rates for hospitalization per 1,000 population, birth rates, number of women in the last month of pregnancy, death rates, communicable disease rates, and average number of injuries. Guides for the selection and use of buildings for hospitals were also furnished, based upon 60 sq. ft. per patient plus 10,000 sq. ft. for such things as operating rooms, laboratories, pharmacy, central supply, x-ray facilities, kitchens and mess areas, administration, triage, and storage. There were a number of data work sheets, covering hospitalization (two sheets), first-aid stations, staff personnel, supplies and equipment, and public health activities.

The field work consisted of either going over architects' floor plans or actually measuring buildings to determine available square footage of space. Part of the technical training consisted of planning actual hospital layouts in selected buildings, such as high schools or junior colleges. There also was training in personnel requirements, estimating needs and balancing them against actual known numbers available. Further technical training, that also combined field work, was to be had in the public health section of the exercise. In the personnel and supply sections, provision was made to request reinforcements from the next higher echelon, which provided for some much-needed communications and additional administrative training.

Over-all, large-scale master plans are essential to the success of our disaster services, just as in military planning. However, there cannot be any degree of success unless the basic units can perform efficiently. These units are the operational subareas, the individual small communities, and the component sections of the larger cities. This exercise was directed primarily to the operational subareas and provided for the collection and evaluation of all of the above mentioned data, based upon previously

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furnished quotas of evacuees. The operational subareas then forwarded their reports, along with requests for reinforcement, to the next higher echelon, where they were consolidated. Each level was to attempt to take care of the situation if at all possible before requesting assistance from the next higher level. In this way there was participation, of differing types, at all levels in the chain of coordination. To clarify this terminology, it should be explained that for disaster purposes California is divided into three regions. The region is in turn divided into several sectors, each one composed of several counties. The next lower level is the operational area, which is usually a county. Because of size, population, and the political subdivision complex, Los Angeles County is divided into seven operational areas. The larger cities in turn are broken down into subareas. The smaller community is an entity but corresponds to subareas as far as organization is concerned. Every level, from the individual community or subarea to the region, is given great latitude in operational activity, with the objective of attaining the utmost in autonomy. Every level does its best to handle the situation before calling upon its next higher echelon for help. This makes for a flexible system that can be used for anything from a relatively minor local occurrence to a major catastrophe.

The requirements for the exercise are briefly outlined from the material submitted to those participating: (1) provide medical facilities for patients arriving from critical target areas; (2) determine medical health problems and case loads among the normal population and among the evacuees; (3) determine the sanitation aspects of refugee care; (4) designate facilities for use as annexes to existing hospitals or for emergency hospitals and assign cadre organizations; (5) determine the number of patients that could be cared for in these facilities; (6) request the supplies that are required, in writing, through existing channels; (7) attempt to obtain "housekeeping equipment" locally if possible; and (8) reserve existing hospital beds for patients with the most serious cases and try to care for the majority of evacuee patients in hospital annexes or in the civil defense emergency hospitals.

Results

Many interesting and important things were revealed when the reports were assembled and broken down on the evaluation sheets that we developed. Of a total potential of somewhat over 5½ million persons, the support areas reported receiving 4,238,000. These were figures developed by the Welfare Service. On the basis of total population, that is, residents plus evacuees, the calculated number of hospitalizations was 26,775, whereas reported patients amounted to 25,731. There is a difference of just about 1,000 between the theoretical total number of patients calculated on a 4.5 per 1,000 basis and the actual number of patients reported.

Further analysis of the hospitalization figures reveals some interesting developments. There were 19,317 beds available for the 25,731 patients, resulting in a deficit of 6,414 beds. Of the 19,317 available beds, only 9,920 were actually used, leaving 9,397 that were not used. At first glance this seems to be a bit incongruous. The explanation is very simple and shows what we considered to be good planning on the part of the reception areas. Instead of putting all of the evacuee patients in the existing hospitals, they activated the civil defense emergency hospitals and also set up emergency hospitals in schools, hotels, and other suitable buildings. This left a reserve of almost 10,000 beds available to be used for casualties if an attack should have occurred. It also would give them an opportunity to use the unfamiliar emergency hospitals for an unknown period of time for the care of patients requiring little medical supervision, prior to the receipt of casualties. This in effect would be a very practical "not so dry run" or, if we could borrow the parlance of the theatrical world, a dress rehearsal.

Analysis of the data concerning the use of the emergency hospitals leads to only one conclusion: we at the upper levels of state-wide planning have not completely put across to those in the reception areas our doctrine for the use of these hospitals. Our concept is to use these hospitals as nuclei around which will be built hospitals with capacities of 500 to 1,000 patients. The reception areas reported that they needed 61 emergency hospitals and that there was a deficit of 44. On the basis of units actually available in the region at that time, including 14 in the then FCDA warehouses, this figure should have been 27 instead of 44. How much of this discrepancy can be accounted for on the basis of consolidation of reports at successive echelons we do not know. This is only one of the many perplexing problems that could occur during actual operations. Based upon paper calculations, the actual number of emergency hospitals that would have been required should have been from 6 to 12, instead of the reported 61, and instead of a deficit there should have been from 22 to 28 hospitals that were not used and were still in reserve for use for casualties. This is a large problem that we must work on.

The use of first-aid stations was also very interesting. Almost universally, the reception areas assigned first-aid stations to mass care and reception centers for the center from which medical care would be given to the evacuees. They committed 212 stations of a total of 353 in the region. Theoretically there

should be 141 stations remaining, but actually this was not the case. Many of the first-aid stations were in the evacuated areas; in fact, there were ony 201 stations stored in the support areas, so there was an actual deficit of 11 stations in the support areas. Another lesson for us was that the first-aid stations cannot be assigned for any other than their intended use and especially cannot be used as superdispensaries in the support areas. We cannot simply tell the people in the support areas not to use them for that purpose. We have to develop something else for this purpose, and we are working on it.

The reported use of blood was another area that was perplexing and apparently not realistic. For the total number of 25,731 patients, there were requested 53,463 blood procurement sets, which logically should translate into an equal number of units of blood required. This is an average of slightly over two units of blood per patient. In an effort to arrive at actual use of blood for everyday purposes in this locality, figures were obtained from the Los Angeles Red Cross Blood Center. In the area serviced by that center, 179,095 units were used in the last year. In this area there are 35,580 beds. With an occupancy factor of 80%, unless my mathematical methods are erroneous, the average use of blood would be 0.175 units per patient for a 10-day period. If these figures are correct, the theoretical requirement should have been 4,500 units. The only logical explanation must be that, in most instances, the reporting support areas were using the blood requirement figures for casualties as the basis for their requests.

Personnel shortages were reported for all categories except veterinarians. In some of the reports it was extremely difficult to reconcile the figures, which is another example of the difficulties that we must expect during actual major disaster operations. There was not one category in which it was possible to subtract the number available from the number required and have the figure equal the reported deficit. Regardless of the cause of these discrepancies—mathematical or typographical errors, faulty message transmission, or some other factor—the fact remains that we must expect erroneous situation reports and take this into account when distributing our available resources. The one fact that stands out is that even in this strategic evacuation, without casualties, there were shortages of significant numbers. Some of these were physicians, about 1,000; nurses, 2,300; pharmacists, 110; nurses aids, 5,000; and laboratory technicians, 280. How much of these deficits could be made up from the evacuees is a matter of conjecture, but we feel that it is safe to assume that after several days there would actually be surpluses of physicians and nurses and probably of pharmacists as well. It is very doubtful if there would be enough nurses aids among the evacuees to meet the requirements. The data concerning first-aid workers was so contradictory and apparently unrealistic that we had to eliminate them from evaluation.

Even with all facilities intact, some areas reported shortages of water and resorted to rationing. This also forced limitation of the use of waterborne sewer systems in some areas, requiring latrines or other means of dry sewage disposal. In still other areas the systems were overloaded, so that at peak flows it was necessary to divert into impounding basins.

Some of the counties felt that it was desirable to do mass immunizations against typhoid-paratyphoid but realistically recognized that it would be difficult, if not impossible, to obtain the required vaccine.

It was gratifying to know that, without exception, all reporting levels agreed that this was the most beneficial and practical exercise that they had participated in. Much information was obtained, many lessons were learned, and defects were found. It was encouraging to learn that without exception any conflicts in the desired use of buildings could be resolved locally, so that arbitration at a higher level was not necessary.

Summary and Conclusions

In a California disaster exercise, the hospitalization problem was solved by activation of emergency facilities, thereby reserving approximately half of the available beds for potential casualties as well as affording the opportunity of familiarization with emergency hospital units before casualties would be received. We have not succeeded in conveying our doctrine for the use of emergency hospitals to the support areas. There were a number of unexplainable discrepancies in reports, making some of them valueless or open to question. Although this is an operational condition that is certain to develop, we must renew our efforts to minimize such occurrences. It is a tactical error to commit first-aid stations for use as dispensary-infirmaries. It is imperative that an acceptable unit be developed for this purpose. The use of blood was entirely unrealistic. As anticipated, personnel shortages were almost universal, although in the most important categories it is believed that the shortages could be overcome in a reasonable period of time. Even with intact supply systems, water shortages developed. In some parts of the United States there would be no problem with this, whereas in others it could be very serious. Sanitation facilities were overburdened or inadequate, requiring reversion to primitive methods. Mass immunization was shown to be practically impossible.

It was felt to be worthwhile to share with you our experiences in this different but very practical form of test exercise, and we suggest that exercises of this type could well be conducted in most of the target areas.

THE STORY OF "OPERATION PREP PITT"

PITTSBURGH'S FIRST DISASTER DRILL WITH SIMULATED CASUALTIES

Francis C. Jackson, M.D., Pittsburgh

The promotion of disaster planning in a community is, at best, difficult and, for certain, unpopular. The disinterest of the public has been attributed to a sense of hopelessness with regard to protection from atomic warfare, to irresponsible planning and inconsistent leadership by government agencies, and to a sense of apathy with respect to the infrequent occurrence of natural disasters.[1] Catastrophe never seems to be imminent.

However, since the medical profession assumes a vital and responsible role in times of disaster, it behooves its membership to persist in preparing itself and in cooperating with other community agencies concerned with health and welfare prior to such catastrophic events.

Although confusion has existed with regard to the functions of physicians within the structure of the civil defense program,[2] there has been no question relative to their traditional responsibilities in their respective hospitals during a disaster in the community. In general, the profession has, heretofore, found itself in an advisory capacity to this agency with little impact on governmental attitude.[1]

The fact that the civil defense program overlooked recurring natural disasters prompted the American Hospital Association to change the title and scope of its Committee on Civil Defense to, simply, that of the Committee on Disaster Planning.[3] The admonition by some authorities [1] to "play down the bomb" implies "play up the hurricane" as a more practical approach to the problem. Dedicated planning by general hospitals to cope with mass casualties to be expected from natural disasters, in theory, would provide a basic organization for national emergencies of a much larger caliber. Certainly, the motivation in organizing for the former is characteristically attended with greater enthusiasm. In any event, the hospital remains as one of the traditional centers for survival by a community.

Recently, the county medical society has been proposed as the "coordinator" of health services for all disaster agencies.[4] The feasibility of this ambitious concept was successfully demonstrated in "Operation Test Star" supervised by the Alameda–Contra Costa (Calif.) County Medical Society in June, 1958. Actually, this vast exercise was the effective coordination of a number of individual hospital disaster plans throughout the counties involved in the exercise.

Chairman, Hospital Disaster Planning Committee, the Allegheny County (Pa.) Medical Society.

Problems and Plans of the Allegheny County Medical Society

In September, 1950, a special Advisory Committee to the Office of Civil Defense in Pittsburgh was created by the Allegheny County (Pa.) Medical Society. Four years later this committee was still attempting to develop functional relations with civil defense groups.[5] Finally, in accord with the general trend noted above, the name of the committee was changed in 1957 to, simply, Disaster Committee. With this broadened frame of reference, the new group was able to engage itself in the full range of disaster preparedness.

In November, 1957, a subcommittee on hospital disaster planning was appointed. The Hospital Council of Western Pennsylvania, with a membership of 70 hospitals, generously offered its support, an association which assured a continuing liaison with the hospital administrators. The end result was the creation of a Joint Committee for Hospital Disaster Planning with a co-chairman from each organization.

The new committee provided itself with 10 major goals: (1) to promote a disaster plan for each member hospital of the council; (2) to guide and assist, when requested, the disaster committee of each hospital in the preparation of such plans; (3) to encourage "dry runs," rehearsals, and "field trials" of such plans; (4) to assist in the coordination of these plans with those of other disaster agencies in the community; (5) to conduct periodic surveys for the assessment of the disaster preparedness of hospitals; (6) to establish a library of disaster information; (7) to prepare and distribute a cumulative bibliography devoted to the management of disasters and allied information; (8) to provide a regular newsletter for hospital disaster committees; (9) to conduct annual "seminars" devoted to all aspects of disaster management; and (10) to sponsor an annual disaster drill at one of the hospitals in the area.

The first survey was conducted in January, 1958, and produced a response from 43 of the 70 member hospitals. Thirty-two administrators indicated that their plans were completed. However, only 14 had ever tested these plans. Therefore, it seemed opportune for the joint committee to sponsor a casualty management exercise at an early date.

First Annual Mass Casualty Drill

To coincide with "Operation Alert, 1958," May 6 was selected as the date for the first demonstration drill sponsored by the joint committee. The name "Operation Prep Pitt" was selected as the title for

the event. A VA hospital was chosen as the site for the exercise for several reasons. It was adjacent to the medical school; it did not have a complete and detailed disaster plan; the majority of the members of its medical staff were resident physicians; the VA was prepared and willing to coordinate its disaster organizing with local disaster agencies; and, finally, the National Damage Assessment Agency had indicated that VA hospitals would probably serve as casualty centers in the time of a national calamity.[6]

even depreciated by civilian physicians.[8] However, it must certainly be appreciated that there can be no differentiation, now, between "civilian" and "military" care in the handling of mass casualties.[9] The number and character of injuries to be anticipated in the next national emergency will, unfortunately, be similar. Therefore, the recommendation that an effective sorting system which provides only life-saving care for casualties with minimal injuries (up to 60% of estimated survivors) should be established in civilian hospitals has considerable merit.[10] It is

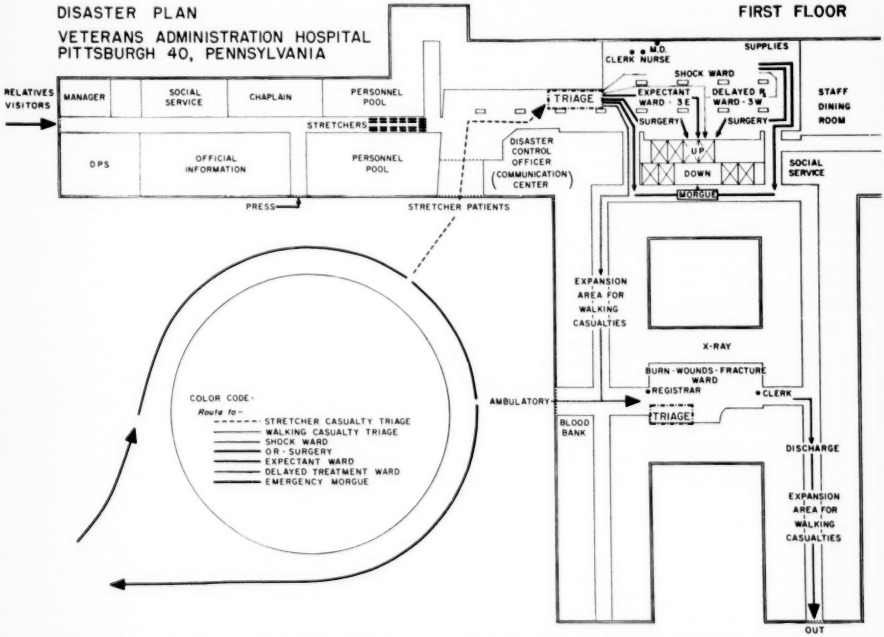

Fig. 1.—Routing organization for stretcher and ambulant casualties for first floor. Principle sections of care are adjacent to arrow routes. Color codes were assigned to each stretcher casualty, indicating his destination as follows: green, shock ward; red, operating room; blue, expectant ward; yellow, delayed treatment ward; black, emergency morgue.

"Operation Prep Pitt" was to provide a "disaster showcase" not only to encourage preparedness in western Pennsylvania but to test three selected aspects of casualty management by a general hospital: (1) the mobilization and expansion of medical facilities, (2) the "military" system of mass casualty care, and (3) the effectiveness of the civil defense emergency medical tags, records, and information cards.

The second aspect was considered to be the most important feature of the exercise. The application of military principles of medical care, so highly successful in wartime,[7] has long been overlooked or

also well to note that, whenever civilian physicians with military experience in mass casualty care have participated in a large civilian disaster and have applied these principles, the results have been eminently satisfactory.[11] For these reasons the committee incorporated the "field" type of casualty flow organization into its first annual disaster exercise.

The casualty load selected was only 50, a number which would severely tax the facilities of almost every hospital in the area. The dean of the University of Pittsburgh School of Medicine and the MEND coordinator arranged for the freshman class

to volunteer their services as "casualties" and "anxious relatives." Medical students are "reliable" casualties and proved "ham actors." [12]

Through the office of the commanding officer, Army Medical Service School, Brooke Army Medical Center, Fort Sam Houston, Texas, a staff sergeant was detailed to supervise the creation of simulated "injuries" by other volunteer students. The use of "make-up" was to prove particularly effective in the orientation of triage officers and in encouraging enthusiastic participation of the ancillary hospital personnel.

relatively unprepared for many of the problems that ultimately transpired. The final disaster plan for the hospital was to be written from the experiences of a "created" natural disaster—in this instance a jet-plane crash on the University Field House two blocks away.

Casualty Flow Plan

Although there are many and, occasionally, insoluble problems in the construction of an organization for mass casualty care, the use of a unidirectional route of flow for the injured within the hos-

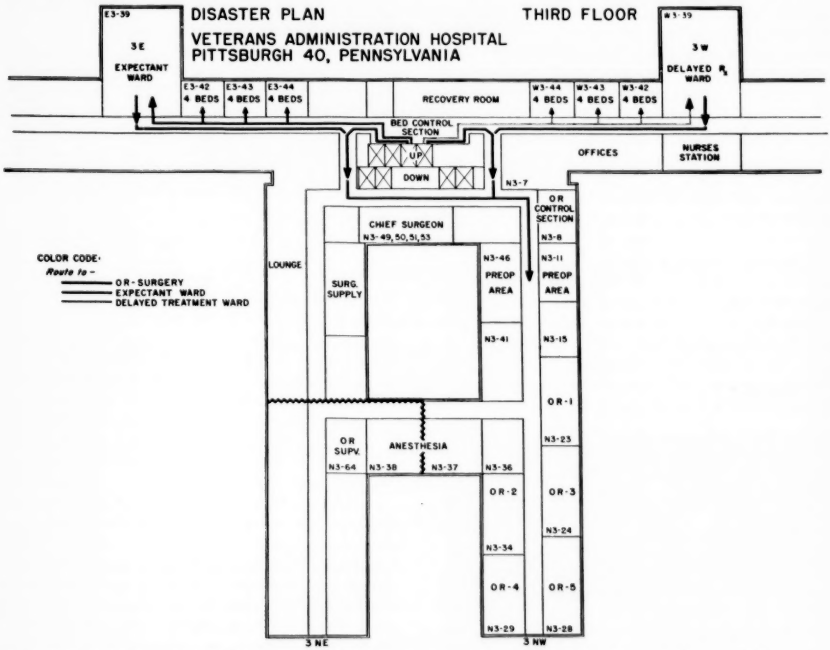

Fig. 2.—Casualty flow chart for third floor. East wing received more seriously injured, while west wing provided temporary care for those whose definitive treatment was delayed. Note locations of bed and operating room control.

A directing or planning commitee was created from respresentatives of each of the 16 major hospital divisions. A tentative casualty flow chart was designed on a portable blackboard, and, at two weekly meetings in the month preceeding the drill, the senior officers in charge of stations along this route (fig. 1 and 2) made changes or improvements. The assignments of personnel, equipment, and supplies were left to the decisions of the section chief and their staffs. Ultimately, 218 employees received drill assignments. However, it should be emphasized that only broad, basic instructions were given so that, as a group, the participants were

pital area appears to be the key to its success or failure. The plan evolved for "Operation Prep Pitt" (fig. 1 and 2) took into account the architectural features of the VA hospital: principally, two large spacious foyers which provided direct access to the entrances, elevators, and halls (i. e., routes for the distributing or discharge of casualties); the location of the regular center of communications; and the location of the primary treatment center, the operating room.

Traffic control at the hospital entrance or "offloading" area was simplified by directing ambulances counterclockwise in order to prevent

congestion in the main drive, a situation which has completely inactivated hospitals in natural disasters.[13] By arbitrary provision of labeling of entering persons as "stretcher casualties" and "walking casualties," an automatic sorting of the injured was provided at the hospital door. Since a connecting roof covered the sidewalk between these two entrances, immediate redirection, if necessary, could be accomplished without the confusion of transport within the hospital.

Twenty service points, or sections, along the route within the hospital were devised to give continuing support to the injured. Ten of these were regular or fixed hospital divisions (such as pharmacy and laboratory), and shift of location or altering of duties was not required. The 12 considered most important are listed in the table, with their assigned duties, capacity, and personnel. The remaining sections were blood bank (donor section), laboratory and x-ray departments, central sterile supply, social service and chaplain sections, security force, and information center. Fifty-six members of the hospital staff were located in these particular areas.

Hospital Organization for "Operation Prep Pitt"—Twelve Key Sections of Casualty Flow

Section or Officer*	Duties or Activities	Capacity	Personnel
1. Disaster control	Supervise and organize evacuation and expansion; maintain communication with disaster site and other community disaster agencies; provide assistance and supplies on demand from hospital sections	...	3 Physicians, 3 messengers
2. Triage officer	Sort and direct stretcher casualties to sections along casualty flow route; maintain log of admissions	...	1 Physician, 1 clerk
3. Shock ward	Treat shock, provide airways, splint fractures, relieve pain; retriage as soon as possible	12 Mobile litters	3 Physicians, 3 nurses, 3 nurses aides, 3 technicians, 2 clerks
4. Delayed treatment ward	Cover wounds, apply splints, treat shock, and prepare casualties for later care; arrange priority of transfer to operating room	40 Beds (28 evacuated)	3 Physicians, 3 nurses, 3 nurses aides, 2 clerks
5. Expectant ward	Provide general supportive care; prepare to retriage, if necessary	40 Beds (28 evacuated)	Same as delayed treatment ward
6 Bed control	Maintain log of ward admissions; notify disaster control officer of need for expansion		1 Clerk
7. Operating room control	Prepare casualties for anesthesia; select qualified operating team for each casualty; provide consultation and relief to operating teams	10 Casualties	3 Physicians, 2 nurses, 2 nurses aides, 1 clerk
8. Operating room (surgical teams)	Lifesaving measures only; stop hemorrhage; débride wounds and pack open; close sucking chest wounds and perforations of bowel; cover tendons, arteries, and bone and revise amputations	5-10 Casualties	16 Physicians (4 in relief), 2 dentists, 9 nurses (2 in relief)
9. Emergency morgue	Identification, finger printing, collection of personal effects	20-30 Dead	2 Clerks, 2 technicians
10. Ambulant casualty section	Emergency care of wounds, burns, and simple fractures; administer tetanus toxoid or antitoxin; issue follow-up instructions	4 Treatment tables, 1 plaster table	3 Physicians, 2 nurses, 2 nurses aides, 3 clerks
11. Communications	Notification of key personnel; keep disaster control officer informed of incoming reports		3 Operators, 2 "walkie talkie" operators, 3 messengers
12. Personnel pool	Provide stretcher, chauffeurs, messengers on request		50 Volunteer employees

* Locations given in figures 1 and 2.

Ambulant Casualty Care.—It was planned that one-half of the casualties provided for the exercise would have sufficiently minor injuries to enable them to walk into the hospital. This section was to be well removed from the entrance through which the stretcher casualties were to be received (fig. 1). It was necessary to "set-up" these facilities from preloaded carts, since an outpatient department is not an integral part of VA hospitals. Those with burns, closed fractures, and soft-tissue wounds were to receive prompt, basic treatment so that immediate discharge of the casualties reporting could be effective. Tetanus toxoid or antitoxin was to be administered if time permitted. Otherwise the follow-up instructions issued to the dischargees from this section noted this omission. The social service department operating in this area was to provide assistance and clothing and arrange for transportation. The logging of the ambulant casualties was to be expedited by collecting their emergency medical tags and completing the index and information cards.

Stretcher Casualty Care.—The more seriously injured were to be off-loaded (fig. 3) from the ambulances by volunteer personnel (maintenance employees) and then placed on mobile litters manned by chauffeurs from the personnel pool (fig. 1). Twenty-five of these litters were to be stored in an adjacent corridor during the alert. In theory, emergency care, including the treatment of shock or surgery, could be performed on this unit without transfer of the injured. Immediate sorting was to be completed by a triage officer in the wide admission foyer. Assisted by a clerk, he was to assign each casualty a color designation (an adhesive strip placed on the forehead or medical tag) in order that the chauffeur could follow a color route (also labeled) to one of five centers, i. e., shock ward, expectant ward, delayed treatment ward, operating room, or emergency morgue. With the exception of the shock ward, the remaining treatment sections were on the third floor (fig. 2). The elevators located nearest to the triage officer and the shock ward were converted to an "up" system and those in the rear to a "down" system. There was to be flexibility in the operation of these elevators manned by the security section. Three of the stretcher casualty sections listed in the table might be elaborated on.

Shock Ward: The shock ward was immediately available in the triage area (fig. 1) but sufficiently well separted so as not to interfere with other traffic originating from it. There was to be sufficient room

for 12 or more of the mobile litters. Since the majority of persons injured in a natural disaster are admitted in a state of shock,[14] it was deemed important that this unit be immediately available and ready to treat shock as well as all injuries contributing to shock. Airways were to be reestablished,

Fig. 3.—Umpire supervising off-loading from ambulances by untrained volunteer personnel.

malaligned extremities splinted, wounds covered, and pain relieved. Retriage would require the assignment of another color designation for the casualty.

Bed Control Officer: The need for further expansion of ward facilities during the height of the drill might not be immediately reported by busy personnel to the disaster control officer. Therefore, a clerk, designated as a bed control officer, was to be stationed opposite the "up elevator" system on the receiving wards to log the admissions and maintain contact with the disaster control officer (fig. 2).

Operating Room Control Officer: The operating room control officer was considered almost equal in importance to that of the triage officer (fig. 4). This officer was to be an experienced surgeon who was to reassess casualties, retreat shock, supervise the administration of preanesthetic medicaments, and assign the casualty to one of the skeletonized operating teams in accord with their talents. He was also to provide consultations and relief for these teams and to maintain contact with all areas where casualties were awaiting further care.

Performance of the Exercise

May 6 proved to be a wet, windy, unseasonable day so that the traffic signs on the exterior of the hospital promptly blew down. Ten minutes after the hospital received the alert at 8:15 a. m., its ambulances were dispatched. Evacuation of 60 patients on wards 3-E (expectant) and 3-W (delayed treatment) was completed at 8:46 a. m. on directive from the disaster control officer. The first casualties were arriving by 9:02 a. m., at which time all sections were prepared to function. The wounds of the medical student casualties immediately created the satisfactory illusion of reality.

The ambulant casualty section was quickly overwhelmed by the simultaneous arrival of almost all the injured able to walk. The logging and identification of admissions fell so far behind that "anxious relatives" created mild consternation in the social service and information sections and then eluded the security guards to arrive at the bedsides of the injured. Although regular communications function well, the number of messengers was inadequate. However, the "walkie-talkie" units functioned exceedingly well inside the building. The absence of a place for noting the religious faith on the emergency medical tags was criticized, as was the fact that registry numbers were not assigned to those admitted. The most satisfactory demonstration was the performance of personnel in the shock ward and the operating room, where few if any errors in casualty care were observed. Within 90 minutes of the first arrival, all casualties had been evaluated and 14 procedures carried out in the operating rooms.

Rating of the Exercise.—A critical evaluation of "Operation Prep Pitt" was provided by a team of five qualified umpires. The chairman was Harry E. Feather, M.D., associate professor of surgery at the medical school and former chief of surgery of the 27th General Hospital of the U. S. Army during World War II. The exercise was rated on a 24-point questionnaire which required opin-

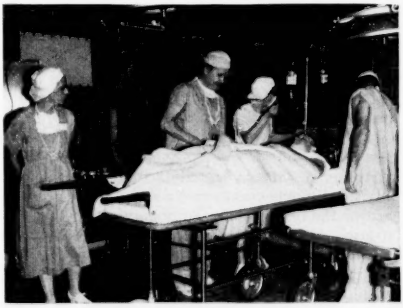

Fig. 4.—Even in operating room control section, casualty remains on original litter. Movement is thereby kept to minimum.

ions as to the location, organization, and effectiveness of the sections along the casualty flow route.

The umpires considered the best feature to be the handling of the litter casualties, particularly in the shock ward and operating rooms. The delay in the identification of the casualties and the dissemination of information were rated as the poorest

features. The civil defense index and information cards were considered ineffectual for their designed purpose.

The handling of the injured at the off-loading area and on admission to the ambulant casualty section was also rated as poor for reasons previously noted. The color routing system was approved, but larger signs and diagrams were suggested.

In conclusion, the drill was rated excellent in 11 areas, good in 5, fair in 2, and poor in 5. A strong recommendation was made that the exercise be perpetuated on an annual basis.

Since "Operation Prep Pitt" was held, four other hospitals in the Pittsburgh area have held drills with simulated casualties. Others have indicated similar intentions.

Summary

"Operation Prep Pitt" was the first annual disaster drill to be sponsored by the Allegheny County (Pa.) Medical Society and the Hospital Council of Western Pennsylvania. It was attended by 147 official representatives of these organizations.

The "military" management of mass casualties by civilian hospitals preparing for disasters could be considered preeminent training for casualty care in time of national disaster.

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GENERAL PUBLIC HEALTH PROBLEMS IN CIVIL DEFENSE

Lieut. Col. Ingalls H. Simmons (MC), U. S. Army

Abraham Lincoln stated the major problem of disaster survival succinctly when he said, "You can't escape the responsibility of tomorrow by evading it today." Although no one at present has all the answers to the problems of survival in mass disaster, it is most important that we become acquainted with the answers we do have and begin thinking of possible solutions to problems which we know may arise in our particular situations.

Major Gen. James P. Cooney, deputy surgeon general, has classified people involved in disaster into five major types: the overly optimistic, the very religious, the fatalistic, the ultraneurotic, and the sensible. The optimist is convinced that whatever is going to happen to him is all for the best. The very religious type dismisses the problem, too, by declaring, "Let God's will be done." The fatalist believes he is safe until his number comes up, and there is not much he can do about it anyway. The ultraneurotic person may even go out and commit suicide to keep from being harmed by the atomic bomb. The sensible type is the only one who takes a positive approach to the problem: he attempts to plan ahead and to learn everything possible to protect himself and others, should disaster occur. The attitude of the sensible type is the one we should all try to have.

Our thinking in terms of disaster situations may be stimulated when we consider, for example, that at Hiroshima approximately 70,000 persons were injured and about the same number killed when the atomic bomb fell on that city. At Nagasaki about

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40,000 were injured and very close to the same number killed. Foregoing a bit of our culture and comforts and getting down to basic essentials, we realize that the first necessities after a disaster will be water, food, and shelter.

Initial Survival Period

In every home, in every eating establishment, and in many office buildings there are excellent sources of emergency water supply—sources which in the confusion of disaster we are apt to forget, even though they are close at hand. Water in bottles in the refrigerator and from melted ice cubes is perfectly safe and protected. Water-packed canned fruits and vegetables will also provide a good source of water. The home water heater, which usually contains at least 25 gallons of water, can be drained by opening a tap at the bottom. A minimum of 7 gallons of water per person per week is the recommended amount.

On the shelves in most homes can be found a fairly adequate supply of emergency foods, such as canned fruit, fruit juices, vegetables, meats, soups, canned or powdered milk, baby food, raisins, packaged cereals, and dried food, which are all excellent, safe food. Each family should keep on their shelves an adequate supply of foods of this type and should rotate them frequently, as many may deteriorate.

The requirement for shelter, the next consideration, will vary with geographical and seasonal situations. There is a great difference between what is needed for adequate shelter in New York City or Chicago in the middle of winter and the South in summer. Shelter includes not only buildings but some sort of body covering, such as clothes, blankets, and sheets. If a disaster occurs in the middle of the night, many people may not be adequately clothed. Consideration must be given to the age and physical condition of the people. Secondary hazards in shelters can occur from escaping gas, from leaks from gasoline storage tanks, from electricity, from man-made fires or collapse of buildings.

Later Survival

After the initial survival period, added to the problems of thirst, hunger, and shelter will be others: insect and rodent control, stray animal control, waste disposal, proper handling of bodies, immunization, personal hygiene, dissemination of information, pharmaceutical and laboratory supplies, obstetrics, and care of premature infants, little children, and the aged. Survival during the initial stages after a disaster is predicated largely on the initiative and preplanning of the individual; later, continued survival depends on the prior planning of the community.

Another imposing problem—the obstetrics problem—is often overlooked in planning. During the bombing of Hiroshima, 27% of all pregnant women had abortions, miscarriages, or normal deliveries. Survival of the United States is dependent on the survival of children and of women of child-bearing age. Any plan must consider care of postnatal and premature infants, as well as normal infants. Other special nursing problems will include care of aged persons and children whose parents are lost or dead.

The proper handling of bodies is a major problem which people do not like to face. What will be done with from 30,000 to 100,000 bodies? Disposing of them in individual graves would be an impossibility. Stacking and cremating them would be unsatisfactory because 40% of the material would remain to be disposed of in another way. The best method appears to be the large, mass grave. The bodies with whatever identification is available should be placed in it and buried. Later on, when the situation is better, they might be exhumed, identified if possible, and given separate burial.

Still another problem is the dissemination of information. Everyone should have a small battery radio with the dial marked with small diamonds pointing to the Conelrad stations. These stations may well be the sole source of information concerning high points of radiation and location of supplementary water, food, shelter, and medical aid.

Individual Measures for Survival

Survival after a disaster comes in steps. If you survive the original event, it is only by preknowledge and preplanning that you can continue to survive until another event, natural or man-made, takes your life. Planning for community survival must necessarily depend upon the survival of individuals. To survive as an individual, you should take the following steps: When you receive warning, close all doors and windows. If possible, back them up with blankets, bedding, bureaus, or something else to prevent the scattering of glass. If you are outside, seek cover in a ditch or in any place that throws a shadow on you; that way, you will get some protection, at least. If you are in a building, seek cover under a bed or any substantial object. At home, if you have a chance, hide under the cellar stairs, or in the corner of the cellar, where you will have at least 3 ft. of dirt between you and the bomb. This is the magic number—at least 3 ft. Wherever you are, always drop flat on your stomach. If you are out walking on the street when a bomb goes off, fall flat, face down, immediately. This is going to be a big American problem, because we are just too curious. Curiosity pays dividends in some ways, but at the time of a thermonuclear bomb it certainly will not pay you to look around to see what is happening. Keep your face down, and count off at least 20 seconds. Do not rush outside; you may rush out just at the wrong moment. You are much safer to stay where you are if you possibly can. This should be especially

stressed: know your signals and follow instructions. Remain calm, and don't run wildly about—this may cost injury or death to you or your families.

In disaster situations never take chances with food and water. Just the simple action of turning a can or a box upside down and opening the end that sat on the shelf, the table, or the floor may save your life. Remember that radioactive fall-out material is just like dust. It is as if you took the sweepings in your vacuum cleaner, shook it in front of a fan, and let it blow all over your home. The main problem is to keep fall-out from getting into your stomach, where it can really do damage. Get official information over your Conelrad stations on your battery radio and follow it carefully. Above all, plan and prepare intelligently ahead of time for disaster, so that when it strikes you and others may survive.

Apathy, stupidity, and procrastination can be the cause of more casualties than the initial disaster. To preserve our birthright of life, liberty, and the pursuit of happiness, we must not trust solely in groups, governments, or God but rather plan and prepare intelligently.

AMERICAN MEDICAL ASSOCIATION SPECIAL STUDY PROJECT REPORT

Earle Standlee, M.D., Chicago

Prior to the successful detonation of the hydrogen (fission fusion) bomb in November, 1952, and of the uranium (fission fusion fission) bomb in February and March, 1954, medical aspects of civil defense planning had been concerned primarily with mass casualty care, little or no thought having been given to the care and treatment of noncasualties. Civil defense had been considered more or less in the light of scattered atomic disasters with recuperative responsibilities within the states and their local political subdivisions. This was the apparent concept of the 81st Congress, as stated in Public Law 920 (known as the Federal Civil Defense Act of 1950).

With the advent of the larger weapons and the knowledge of their vastly increased destructive capabilities, civil defense began to take on a newer meaning: national survival with the capability of the surviving population to arise from the ashes of mass destruction and piece together the remaining segments of national economy to support the armed forces in waging war to a successful conclusion. Likewise, the medical problem began to assume correspondingly larger proportions, in that under this concept medical care must now encompass not only the treatment and care of mass casualties but noncasualties as well. In addition, the medical problem would be further compounded by the tremendous loss of professional and nonprofessional medical personnel, as well as a large percentage of existing medical facilities and large segments of the medical manufacturing industry. Medical planners in the federal government (Federal Civil Defense Administration) thus became faced with professional facets which they felt only the medical profession itself could resolve. Included among these was the determination to what degree medical allied personnel, such as nurses, dentists, and veterinarians, could participate in medical care techniques ordinarily reserved for physicians and what training they should have in peacetime to prepare for such participation following mass attack. It was with this in mind that the FCDA sought and obtained a research contract with the American Medical Association to develop criteria needed as a basis of a national emergency medical care plan for the treatment and care of the surviving population in the event of thermonuclear warfare involving the United States.

In the Scope of the Contract, the A. M. A. is called upon to study, develop, and recommend the planning, training, and operational organization needed as the basis for a national emergency medical care plan. It furthermore calls for the A. M. A. to furnish advice and recommendations for an organizational plan which will result in the optimum of medical care to the United States in the event of enemy attack, study and develop recommendations for the utilization of professional and nonprofessional personnel of the medical and related professions in a postattack period to carry out the medical care plan, outline the basic role and emergency medical responsibilities of the medical profession in the immediate preattack and postattack periods, outline those functions and responsibilities of the medical profession that may be properly delegated and performed by paramedical personnel under the general direction of the medi-

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cal profession, furnish advice and recommendations as to the training and education that is needed by all health personnel, professional and nonprofessional, so that they may be prepared for operational capability in the event of enemy attack, and furnish advice and recommendations as to the post-attack sorting of casualties.

Activation of the Project

For carrying out its responsibilities under the contract, the A. M. A. created the Commission on a National Emergency Medical Care Plan and vested it with the authority and responsibility for planning, initiating, establishing, and directing the study project.

The Commission viewed civil defense not in the more common and limited concept of being "concerned mainly with rescue operations and services to stricken populations" but rather in the broader concept of its being a dynamic aspect of national defense with importance second only, if not equal, to that of military defense and concerned "with the whole complex of nonmilitary activities necessary to prepare and mobilize the nation's economy against possible war, to survive and emerge from the ashes of attack, to maintain the continuity of government and essential production, and to proceed toward partial recovery and then toward full resumption of peacetime pursuits." The latter concept was that which had been adopted by the Congressional Subcommittee on Military Operations in its studies of "Civil Defense for National Survival."

Major Gen. Otto L. Nelson, who headed the East River Study Project in 1951 and the review of that study in 1955, in a statement to the Subcommittee on Military Operations on March 4, 1956, described briefly the various views on civil defense that seem to have some measure of acceptance. I would like to quote from his statement in indicating these views:

> First of all, there are those who believe that nothing should be done and no money should be spent at all on nonmilitary defense. This view holds that the United States should spend its money and expend its resources on a strictly military defense program in the belief that in this way we get the most for our money and that, as a minimum, we need to spend all that economy can afford on our military fighting forces. In effect, our people, cities and industries have to be considered as expendable because it either costs too much to defend them or, no matter how much is spent, the defense is still ineffective. This view holds that a calculated risk must be taken with respect to our cities, industries and people and that our over-all defense is best served by spending all available resources on strictly military defense.
>
> A second view is quite close to the first, except that it supports a minimum nonmilitary defense program that is admittedly inadequate and ineffective. I suppose that essentially this is a sophisticated attitude which would lead the people of the country to believe that some effective steps were being taken for their protection in an atomic age, although actually the program is so ineffective as to be a total waste of funds involved. Perhaps an extreme way of putting it is to say that, under the concept, one considers the nonmilitary defense task to be so difficult, complex, and expensive that there is no practical or effective solution. However, this is not to be admitted publicly but instead an ineffective, phantom program is set up with appropriate individuals and agencies to serve as scapegoats if such are needed at a later time. In a sense, one might say that this is a "cover plan." Such has been used in military operations in an effort to delude the enemy that military activities were going on in an area with a view toward later military operations which, of course, were not contemplated. In the field of nonmilitary defense, I doubt that such indications of a nonmilitary defense cover plan with ineffective activity would delude an enemy, but it might lull the general public of the United States into a false sense of safety in this atomic age. I suppose the justification for such an attitude is the feeling that for political reasons something must be done, so you make a gesture in the absence of any effective program or the knowledge of how to undertake one.
>
> A third view is that nonmilitary defense ought to be a vital and continuing part of an over-all and balanced total defense program. This view recognizes that our active military defense forces should have first claim on the defense funds that are available. Certainly, a strong balanced armed force of land, sea and air elements is needed, capable of fighting an atomic war or available to block the Soviets' use of power politics through satellite countries where resource to atomic weapons might be avoided. In addition, there is needed the continuing maintenance of the military might needed to strike a crushing retaliatory atomic blow against an aggressor.

In its studies the Commission followed the concept outlined in the third view. In laying the groundwork for its study, the Commission elected to obtain material from the following sources: (1) a hypothetical 20-megaton ground burst thermonuclear attack upon a selected geographical area, (2) planning data developed by the several states in their critical target areas, (3) pertinent literature, including governmental and nongovernmental publications, and (4) conferences and communications with appropriate agencies and individuals.

In making its selection of a geographical area for study, the Commission gave consideration to five selected areas before making final decision on the Minneapolis-St. Paul complex. The reasons for selecting this area were as follows. It is included in the FCDA list of critical target areas. Both cities can be destroyed with a single 20-megaton ground burst attack. The area has available space relationships for radius utilization in all directions. A river (Mississippi) runs through the center of the target area. The overflow into Wisconsin brings in political factors. The surrounding area abounds in food and water. Civil defense planning, including medical, was reputed to be well advanced. Good working relationships were reputed to exist between persons and organizations concerned. Top level leadership exists and has a high degree of motivation. Good health personnel and facility data were reputed to have been developed. The Mayo Clinic and affiliated facilities, with 800 physicians and capacity for expansion to 9,200 beds, provides an asset outside the target area. The state of Minne-

sota reputedly has an effective civil defense legislative act which provides for strict discipline in the event of a major emergency.

Approach to Study

The Commission then approached the study on a four-phase basis as follows:

Phase 1.—Fact-finding and data gathering were attained by observation of planning activities, demonstrations, staff exercises (Operation Alert 1958) in Minnesota, and mass casualty courses given by the Army; by review of planning data in Minnesota and the various (36) other states; by conferences with planning personnel in Minnesota; by conferences and meetings with representatives of the Minnesota Medical Association and Hennepin County (Minn.) Medical Society; and by review of published literature. The latter includes hearings before the subcommittee (Holifield) of the Committee on Government Operations, House of Representatives, 84th Congress, 2nd Session, 1956; extracts of hearings, prepared statements, and Report of the Medical Service Task Force of the Commission on Organization of the Executive Branch of the Government, 1954 (Hoover commission); reports of civil defense conferences; articles on medical aspects of civil defense published from time to time in THE JOURNAL, *Minnesota Medicine*, *California Medicine*, and *Canadian Medical Association Journal;* and pamphlets, bulletins, and other literature published and disseminated by the Office of Civil and Defense Mobilization.

Phase 2.—Analysis of data and findings involved examination and classification, evaluation—weighing the important relevance of each, and determination of their relation to each other and to other similar existing data.

Phase 3.—A tentative generalized plan outline was developed.

Phase 4.—Conclusions were developed and recommendations submitted.

Participation of Medical Organizations.—From the beginning, the Commission considered it essential to bring into the research study, on a participating basis, national health and medical organizations which would be directly involved in the medical management and care of the surviving population in the event of an enemy mass attack on the United States. After due consideration, it was decided that such participation would, under the circumstances, best be effected by the establishment of appropriate task forces to assist the Commission in its study project.

This concept was concurred in by representatives of the following national organizations: American College of Surgeons, American Dental Association, American Hospital Association, American Nurses' Association, National League for Nursing, American Public Health Association, and American Veterinary Medical Association.

Task Forces

Three task forces were established to assist the Commission in its studies of the items specifically called for in the contract: Task Force on Organization, Task Force on Personnel Training and Utilization, and Task Force on Emergency Medical Care.

The Terms of Reference of the Task Force on Organization called for two areas of consideration in its studies: (1) that of a national organization with its mission, organizational structure, position in the national plan, and channels of communication with delegation of responsibility and authority and (2) that of a local organization with its various elements of organizational structure, their functions, and operational procedures. The following organizations participated through representation in this task force, under the general direction of the A. M. A. study group: American College of Surgeons, American Public Health Association, American Hospital Association, American Dental Association, American Nurses' Association (also representing the National League for Nursing), and American Veterinary Medical Association.

In its Terms of Reference, the Task Force on Personnel Training and Utilization was called on to recommend the manner in which the various categories and numbers of health personnel surviving a mass attack could best be utilized to cope with the many varied and complex medical problems with which the nation immediately would be faced. It also called for recommendations for the development of policies, means, methods, and programs for the training and education needed to prepare all health and medical personnel, professional and nonprofessional, for occupational capacity in the event of enemy thermonuclear attack. The following organizations participated in the studies of this task force: American College of Surgeons, American Academy of General Practice, American Public Health Association, American Hospital Association, American Dental Association, American Nurses' Association, American Veterinary Medical Association, and American National Red Cross.

Terms of Reference for the Task Force on Emergency Medical Care called for consideration to be given to every possible means and methods of casualty management that would provide optimum care under mass attack circumstances. It was also asked to consider the desirability and practicability of utilizing paramedical personnel to perform under the supervision and direction of physicians certain medical functions, particularly lifesaving functions, ordinarily performed by physicians themselves. Its Terms of Reference pointed up the problem of triage or sorting, and the task force was asked to give consideration to the development of medical methods and means of maintaining the personnel resources of the United States with the maximum strength possible under the circumstances to assure

the nation's survival. The following organizations participated in this task force's studies: American College of Surgeons, American Public Health Association, American Hospital Association, American Dental Association, American Nurses' Association, and American Academy of General Practice.

National Civil Defense Studies

In conducting its studies, the Commission has taken advantage of two exhaustive inquiries, one on the subject of civil defense for national survival and the other on medical planning for total war. The first of these two was conducted over a period of a year by the military operations subcommittee of the Committee on Government Operations, 84th Congress, 2nd Session, commonly referred to as the "Holifield subcommittee." The other inquiry was conducted by the Medical Services Task Force of the Commission on Organization of the Executive Branch of the Government, commonly referred to as the "Hoover commission." The report on this study was published in 1954, while that of the Holifield subcommittee was published in 1956. Both studies gave strong emphasis to the need for a shift in civil defense responsibility from the states to the federal government in civil defense planning. The Holifield subcommittee strongly recommended that the federal agency charged with this responsibility be required to formulate a master plan for nationwide civil defense and that such plan be pointed toward the establishment of an integrated, nationwide civil defense system.

The medical task force of the Hoover commission in its summary and conclusions stated that "a complete medical plan is an inescapable requirement for survival in an atomic age. Our nation does not have such a plan at this time [1954] nor is it possible to formulate one without some drastic revisions in national policies and organization. As a nation we are grossly unprepared, medically, for total war. Present attempts at wartime medical planning, in our opinion, are ineffective. Multiple approaches to the medical problems of civil defense, which have been adopted by the various states, have resulted in an uncoordinated and inoperative program. . . . Failure to take forceful and aggressive national action to prepare ourselves medically and otherwise for devastation and destruction of atomic warfare is, in our opinion, an open invitation to disaster."

Organizational Criteria

In developing its criteria, the Commission made the assumption that "a Federal agency charged with the planning for, and capable of directing, the recovery efforts of the United States following a mass attack thereon, and so integrated into the Federal government as to assure coordination between all interested agencies, both prior and subsequent to such an attack, not only is necessary, but is attainable." It furthermore assumed that "the United States was able and willing to spend adequate funds on a well conceived civil defense plan for the nation."

The Commission views the task of preparing a national emergency medical plan which would, in fact, prepare the nation, medically, for total war, as a tremendous undertaking but one that is not unattainable and that should be initiated at the earliest moment. In its conclusions, the Commission considered the following steps necessary to initiate and develop such a program:

First, a medical planning group would be established at federal level, staffed with an adequate number of specialists to permit an accurate estimate of the current situation, a determination of the medical requirements, an evaluation of the potential medical resources within the United States, and the formulation of plans which, when implemented, will provide the maximum care to the greatest number with the means at hand. The planning group should be under the cognizance, if not the direction, of the OCDM.

Second, on formulation and approval of operational and training plans prepared by the initial group, a training organization would be established as a major division of the operational headquarters to be formed at federal level. The training division would be staffed with an adequate number of training specialists, as determined by the planning group, and composed of many of the personnel of the group, whose missions would have now been discharged. This division, under the supervision of the medical director, would be responsible for preparing the detailed training programs, written material and training aids appropriate for instruction of each level, and grouping of citizens in the United States; distributing and supervising the use of such material; furnishing all manner of advice and assistance in execution of the training programs; providing competent training teams to assist in organizing similar teams at state and other levels; and even conducting training for some of the higher echelons within the profession.

Third, concurrently with formation of the training division there would be organized at peacetime strength the final, permanent, operational medical element of the agency charged with the supervision and control of national survival efforts. This group would become the medical directorate, which would correspond to the Office of the Surgeon General of the Army, Navy, Air Force, or Public Health Service. Formation of the final organization at reduced strength is necessary on completion of the planning phase in order that a functional directing headquarters, capable of immediate expansion and efficient operation, would be available should war be thrust on the country prior to completion of the training phase of the three-step program. On attainment of a satisfactory training state, or at any

time deemed appropriate, the training division will be reduced in size and reassigned to the nonprofessional division of the director's office as a training section.

In case of war or impending war, the medical directorate would be expanded to required strength, would become fully operational, and would absorb such personnel of the training division or section as may be required under the then existing circumstances. The determination as to where the medical directorate should function in the federal structure in peacetime has not been made. It is believed, however, that the medical directorate should be a major part of an agency whose functions pertain primarily to survival of the nation after an attack.

Planning Group

In the organization of the medical planning group, the director has a deputy, legal adviser, comptroller, and office administrator. The director is responsible for planning and recommending the organizations, missions, functions, and mode of operation of the future medical directorate, or medical headquarters to include the training division. The deputy assists the director in all of the latter's activities. An office administrator is required to handle the administrative matters within the office. A legal adviser is essential in order that the director may avoid the enunciation of policies and the preparation of plans that may run afoul of federal and state laws and statutes. Legal advice will also be required on matters pertinent to proposed legislation and repeal of hampering legislation.

Subordinate to the director are two major groupings: (1) the operations division and (2) the professional division. The operations division chief and his deputy are the master planners. They have a publications editor to assist in such matters as editing, determining format, and selecting pictures, illustrations, types of paper, and binding, and similar printing problems.

Organization Branch.—The organization branch of the operations division would have primary responsibility for determining and designing or redesigning the medical field organizations of all types required to provide casualty and noncasualty care to the surviving population. Such organizations would include first-aid stations, field hospitals, specialty treatment centers, specialty teams, convalescent hospitals, holding units, medical supply depots, and motor, rail, water, and air evacuation units, among others.

Plans Branch.—The plans branch would determine the number of field assemblies of the various types required and the allocation thereof to the states; choose the storage sites for assemblies, supplies, and equipment held in strategic reserve; prescribe the doctrine relative to the employment of field units, fixed installations, and nonmedical personnel; devise plans that will assure the necessary communications and transportation facilities for emergency situations; prepare the plans that will assure that the general public is adequately informed of the problems involved and the progress being made toward their solution; determine the final personnel strength and organization of the medical directorate, with special attention to the training division, and prepare the final, over-all training and operations plans for the director.

Training Branch.—The training branch would be charged with preparation of adequate training plans for all categories of personnel capable of absorbing technical and first-aid training; determination of the training literature and training aids that will be required; determination of which existing literature and training aids are suitable; and working out of practical training plans with the various states, professional and nonprofessional groups, professional, semiprofessional, and nonprofessional schools, fixed and field-type medical installations, and governmental and public information media, in order to insure maximum training for personnel of all categories, to include the general public.

Equipment and Supply Branch.—The equipment and supply branch would determine the items of equipment and supply and amounts thereof to be provided each type of field unit, as well as the amounts to be placed in strategic storage; prescribe storage, stock record, rotation, and inventory procedures; determine suitable packing and crating specifications; and devise methods to insure against deterioration of stocks in storage and against loss through fire and pilferage.

The professional division chief and his deputy are the master planners insofar as casualty and noncasualty care, preventive medicine, and public health matters are concerned.

Medical Care Branch.—To assist these planners, a medical care branch would be established, consisting of those medical specialists required to determine principles and practices which would be followed to insure the best possible care to the greatest number after a nuclear disaster. Additionally, the medical care branch would determine recommended priorities for treatment, the recommended employment of medical personnel, and, in conjunction with the allied professions branch and the plans branch, the recommended employment of allied medical personnel. Proposed training programs for medical and nursing personnel would be prepared and submitted to the training branch for incorporation into the final programs. Plans for obtaining, preserving, shipping, and use of whole blood, blood derivatives, and plasma volume expanders would be the responsibility of the medical care branch.

Allied Professions Branch.—The allied professions branch, in conjunction with the medical care branch and the operations division, would determine the recommended employment and training of the various categories of paramedical personnel. This

branch would also be charged with determining which laws and statutes currently interfere with the adequate training of paramedical personnel and, in conjunction with the legal adviser, devising ways and means of having such laws suitably amended or repealed.

Public Health Branch.—The function of the public health branch would be the preparation of plans to insure the continued health and physical stamina of the large numbers of uninjured, both prior and subsequent to a thermonuclear attack. This is a problem of very great scope. A medical intelligence officer is included in the public health branch for the purpose of keeping all members of the medical planning group apprised of those developments in nuclear energy which have medical implications and which either have not been published or have been published in foreign mediums.

Biological and Chemical Branch.—Since the use of chemical and biological agents by a potential enemy cannot be eliminated, a small biological and chemical branch has been included in the planning group to prepare those operational and training plans that will insure maximum protection from and rapid recovery after the use of these types of weapons. Also, this branch would recommend the organization, functions, and missions of the biological and chemical branch of the medical directorate.

The planning group would include 29 physicians, 1 dentist, 1 veterinarian, 4 nurses, and 32 laymen—a total of 67. These figures, at first glance, or to the uninformed, may seem large. They are not as large as the problems to be solved by the medical planning group, however. Without a planning staff adequate in numbers and quality, the plans devised thereby will be faulty or inadequate.

Role of the Medical Profession

The task force studies have indicated that the national allied medical and related associations are very much interested in the part they might be called on to play in the medical care of casualties and noncasualties after a mass attack on the United States. These studies have also indicated the willingness of those associations to follow the lead of the A. M. A. as the representative of organized medicine in developing a national medical program. The studies, furthermore, indicated a dire need for a medical organization in a top level federal agency engaged in civil defense planning with a similar need for a complementary organization within the medical and allied professions.

Provision has been made for the participation of the medical and allied professions as well as the other related professions in the planning phase. A medical advisory council proper, consisting of nine physicians who are members of and appointed by the A. M. A., would be in a position to wield great influence not only on the government but on its own members and nonmembers of the medical profession.

At no time in history has such a challenge been presented to any professional organization as that currently posed on medicine by the threat of an all-out war involving the continental United States. Not only is it the duty of organized medicine but it is the right and privilege of physicians in the United States, through the A. M. A., to assume the lead in advising the government on plans for both preventive and curative medicine to be implemented in case of national disaster. Undoubtedly, the medical profession is willing to assume the leadership in solving the multitude of problems involved. Certainly, the allied medical professions are looking to the A. M. A. for such leadership. A full-time staff is considered an essential element of the advisory council.

The functions of the council would be to provide advice to the director of OCDM and to the director of the medical planning group on all phases of disaster and survival medicine, national medical organization and functions, national medical plans and policies, field medical organizations, their employment and equipment, utilization and training of medical and allied health personnel, training of all segments of the population, medical equipment and supplies, public health, preventive medicine, and welfare matters, medical aspects of chemical, biological, and radiologic warfare, and communications and transportation required to support the medical efforts.

Such advice would be given when sought by either of the directors, when new material should be made known to either of the directors, and when material published or about to be published by the planning group is not in keeping with policies and principles of the A. M. A. or the high traditions of the medical and allied professions.

To assist the council would be six advisory committees, each consisting of experts in their fields, appointed by their parent national organizations at the invitation of the A. M. A. These committees would work on problems pertinent to their fields, prepare appropriate studies and recommendations, and submit them to the council for its consideration. Material approved by the council would be transmitted to the director of the medical planning group through the director of the OCDM for incorporation into plans, procedures, or policies, as appropriate. When accord between the council and the planning group is reached, such material would be translated into policies for dissemination by the A. M. A. through state and county medical societies to members and other professional and interested organizations.

With such an organization in being and functioning, not only would the federal government feel secure that its medical plans and policies were feasible, proper, and sound but organized medicine and all allied interests would also feel secure that the steps taken by the federal government to prepare for an eventuality were the best possible.

Further, the A. M. A. would be providing the leadership and guidance so sorely needed, would be in a commanding position insofar as solutions to national disaster medical problems are concerned, and would be assuming its rightful role not only in this important phase of medicine but also in the very survival of the United States.

In all previous wars, while the medical profession has been an important adjunct to combat and military activities it has nonetheless been no more than an adjunct. In the future all-out, mass-type warfare, plans for employment of the medical and allied professions prior to combat and the effectiveness with which their skills and resources are applied immediately afterward will determine whether the nation lives or dies.

Medical Directorate

The organization of the medical directorate is a much more extensive establishment. While the medical planning group was made up of a number of planners, free of preconceived ideas and stereotyped thinking and with missions that will probably require two years to complete, the medical directorate is designed to be a permanent body, so organized and staffed as to execute the operational and training plans of the predecessor organization and prepared to supervise and direct the nationwide medical service in the event of a national disaster.

The broad functions of the medical directorate would be to maintain current the estimate of the medical situation in the United States; maintain current the estimate of the medical requirements necessary to support the United States in case of a national disaster; maintain current the estimate of the medical resources available in the United States; maintain current the operational plans which, on implementation subsequent to an attack of any type on the United States, will provide the greatest amount of medical care to the greatest number; be prepared to execute prepared national medical plans and policies; maintain current the training plans which will insure that all segments of the population of the United States are prepared psychologically for an all-out attack and are prepared to assist themselves and others through the provision of self-aid and first-aid and that those groups with the potential are prepared to assist the health professions in the care of the surviving casualties and noncasualties; carry out the training plans formulated by the medical planning group; maintain a complete, up-to-date, detailed listing of medical and allied health personnel in the United States to permit an immediate mobilization in case of disaster; determine, procure, allocate, disperse, store, and maintain records on and surveillance over the medical supplies and equipment, including first-aid supplies, required to provide medical service to the surviving casualty and noncasualty population of the United States after an all-out attack; determine and promulgate the policies and principles pertaining to disaster medicine that will insure maximum care to the greatest number within the means available subsequent to an all-out attack; determine ways and means and promulgate policies and principles that will provide the maximum protection against and the most rapid recovery from the effects of chemical, biological, and radiologic warfare agents; determine ways and means and promulgate policies and principles that will insure maintenance of the highest possible state of health, well-being, and morale of the uninjured surviving population; be prepared to establish a statistics and medical records office; supervise the activities of the medical sections of the regional offices; maintain liaison with those professional associations, agencies of the federal government, educational institutions, and industries whose activities have an impact on medical civil defense; and obtain, evaluate, and collate information pertaining to all aspects of mass weapons having medical implications and generate medical intelligence.

The medical directorate would be organized and become functional immediately on accomplishment of the missions assigned to the medical planning group. The reason is twofold: (1) to initiate execution of the plans devised by the planning group and (2) to have in being an organization ready to function in case of war.

Space does not permit a detailed description of the medical directorate, its personnel requirements, and its functions. Furthermore, the detailed planning for this organization is properly the function of the planning group, based on its estimate of the over-all situation.

Conclusions

I wish to emphasize that if an adequate medical service is to exist and be ready to function when required, a coordinated and comprehensive effort by an adequate staff to develop and implement a feasible plan is an immediate essential. The problem of health and medical care in the nuclear age, when living casualties after one attack may number millions, when medical resources probably will not be adequate to cope with the overwhelming numbers dependent on those resources, and when every individual who has a potential for work must retain that potential or have it restored to him at the earliest practicable moment in order that he may return to some form of recovery activity, is the most serious and vital problem that the United States, and especially organized medicine, has yet faced. Without a planning effort and a training effort in keeping with the magnitude of the problem, the recovery after an attack on this country, and even the life of the country itself, is in serious jeopardy. I believe the plan presented will meet the requirements of the situation.

OPERATION STAR

Burton E. Adams, M.D., San Leandro, Calif.

Shortly after 6 p. m. on Friday, June 20, 1958, Alameda and Contra Costa counties in California began picking up the pieces that remained from the largest disaster ever to strike the area. A simulated earthquake equivalent in force to the famous San Francisco quake of 1906 rained death, destruction, and ruin on the two heavily populated areas. By the time the count was completed, casualty figures ran to well over 3,000. The total number of dead had not been tabulated since the full disaster relief effect of both counties was directed toward emergency collection and treatment of the injured. Within the four-hour period from 6 p. m. until 10 p. m., a total of 2,100 simulated casualties had been collected at a dozen disaster sites and collection and sorting stations, given first aid and emergency lifesaving treatment at these locations, loaded into innumerable moving vans and mass transportation vehicles, and taken to hospitals in the bi-county area where they were provided with definitive medical treatment.

The operation was completed successfully only because some 3,000 persons took an active part in the disaster relief operation, all 24 hospitals located in the two-county area participated under their individual sector commands as did civil defense personnel of both counties and from all necessary services, and, last and most important of all, intensive planning had preceded the operation on all levels.

The best way to give you a picture of what was involved would be to follow the steps leading up to the actual exercise, describe the operation itself, then point out some of the lessons learned, both good and bad—what worked, and what did not work.

Preplanning

Operation Star culminated five years of work by the disaster committee of the Alameda–Contra Costa Medical Association headed by Dr. Wayne Chesbro. It began with stimulating the formation of concrete hospital disaster plans put to the test force by Operation Medic involving one hospital in Berkeley in 1956, then Operation Pill Hill involving five hospitals in Oakland in 1957, and an actual disaster by an explosion in a ship at Todd Shipyard, with 40 casualties. This was preliminary training.

The definitive planning for Operation Star started five months ahead of the actual test operation. General ideas regarding its purpose and scope and the nature of the test exercise were discussed and agreed upon by the committee.

Member, Committee on Civil Defense, Alameda–Contra Costa Medical Association.

The major objectives of the exercise were as follows: (1) to offer training to the medical and technical personnel of the disaster site sorting stations and the respective major hospitals of Alameda–Contra Costa counties in the initial care of casualties from a major catastrophe of local nature and the eventual and definitive care of such casualties in the major hospitals; (2) to demonstrate the adequacy of medical planning and the coordination of such planning for large-scale local disaster by the Alameda–Contra Costa Medical Association; and (3) to invite observation and evaluation of such demonstrated planning by official civil defense personnel of local, county, state, and federal levels, as well as members of the Council on National Defense of the American Medical Association and the armed forces.

Next, the nature of the disaster was discussed. Up to this time much of our planning had been with an atomic blast in mind. However, such a catastrophe tends to make an individual feel hopeless in the situation. Either you have "had it" and you will not need to worry, or it missed you and the catastrophe is so great that as an individual you cannot do much about it except to evacuate. These subjective feelings engender a lethargy and a feeling of "what is the use of working anyway, when there is a good baseball game I could go see?"

However, in California an earthquake is a very real thing. In the San Francisco Bay area, history is related to two events: the gold rush or the earthquake and fire of 1906. A major earthquake fault line runs through Alameda and Contra Costa counties, and one or more times a year we pick up the paper to read that a tremor of magnitude x was recorded or perhaps we are standing in the living room and hear a rumble and feel a shake. We look out to see if a truck is going by, then look up to watch the chandelier swinging and to see if there are any more cracks in the plaster. Thus, we are conscious of earthquakes, and I personally have seen the results of the Santa Barbara quake of 1925 and the recent Tehachapi quake.

For the reason, then, that such an earthquake is an ever-present possibility in our area, it was decided to use a large quake of Richter magnitude 9 as the destructive force. Moreover, an earthquake could realistically be expected to cause disruption of utilities as well as destruction of industries which routinely carry on all manner of chemical, biological, and radiologic processing operations. Here was an instrument for creating casualties from physical trauma, chemical and heat burns, smoke and fume inhalation, acute psychological trauma, and radiologic contamination.

Once general plans had been made, we soon found it necessary to expand representation at the Alameda–Contra Costa Medical Association meetings to include the following groups, to whom specific assignments were given: civil defense directors, sector chiefs, disaster chairmen of individual hospitals, women's auxiliary, military representatives from department of defense installations involved, American Red Cross, Boy Scouts and rangers, hospital labor councils, and news media.

After the initial meetings called by the Bicounty Medical Association Disaster Committee had familiarized the major participating agencies with the suggested format of Operation Star, detailed planning was further carried on by civil defense and Medical and hospital representatives in their local jurisdictional areas. Over-all coordination of the bicounty program was effected by repeat meetings of the Medical Association Disaster Committee with attendance by representatives of local government. The 20-minute motion picture "Operation Pill Hill," which recorded the salient portions of the earlier disaster drill involving five hospitals (four on one hill) in Oakland, Calif., was shown repeatedly to groups intending to participate in Operation Star. Copies of the film, produced by the Alameda–Contra Costa Medical Association, were made and retained for use and loan by the Oakland Civil Defense and Disaster Organization and the California Department of Public Health.

Although all local planning for the big drill did not necessarily follow a strict pattern, the detailed local plans for participation in Operation Star generally consisted of two major coordinated efforts.

Local Participation.—The first effort was toward community-wide coordination of all civil defense and sector chief medical and health service participation. This involved alerting transportation, communication, law enforcement, medical and health, and ancillary personnel. In many cases, additional volunteer recruitment and training was necessary. The sector chief medical services and local civil defense organizations decided on the location of disaster-site sorting stations within their areas. In most cases public parks or school grounds were selected which were more or less equidistant to the hospitals to which they were to send patients. There were 12 disaster-site sorting stations actually used during the test. Although local areas varied somewhat in communications arrangements, the over-all plan was for each disaster-site sorting station to communicate directly to local respective area police radio control centers (generally by short wave radio) and from there by telephone to the Alameda–Contra Costa Medical Association Headquarter Control Center. In the Oakland area, a further refinement of this plan included radio contact by handie-talkie units between the triage command post at the disaster-site sorting station and the individual medical teams dispersed at the disaster site providing field first aid to casualties.

Casualty transportation was quite realistic and consisted of large moving vans volunteered for such use by local commercial transportation companies. As many as 15 casualties could be taken (without stacking litters in the van) to one hospital all at one time. Such forethought not only made it possible to deliver rapidly large numbers of casualties for definitive treatment (with a minimum of transport involved) but also imposed "surge loads" of casualties on the receiving hospitals. It was believed that such an arrangement more nearly approximated actual conditions in a large-scale disaster, in that it required the handling of large numbers of casualties at one time rather than one at a time which occurs upon arrival of an ambulance or automobile.

Hospital Participation.—The second major local effort was undertaken by each of the hospitals participating in the exercise. Several of the 24 hospitals held preliminary drills in anticipation of the big quake. Each of the 24 reviewed, wrote, or rewrote its hospital disaster plan with an eye toward bringing the plan up to date and familiarizing the staff with the plan.

It is worthy of note here that only the most cooperative attitude was evidenced by all hospital staffs involved. It is, however, felt by some that recent changes in the requirements of the Joint Committee on Accreditation of Hospitals (THE JOURNAL, Jan. 18, 1958) assisted materially in pointing up the necessity for adequate hospital disaster planning.

The Test

With preliminary planning for the exercise in the background we will attempt to give an account of what actually occurred during Operation Star without too much detail as to the line of authority involved.

Shortly after 6 p. m., casualties began arriving at the disaster sites. The casualties consisted of Boy Scouts, members of community civic and social groups, and families of participants. They were tagged with emergency medical tags on which diagnoses had been previously written, and small teams of first-aid workers and nurses under doctors' directions went to work providing appropriate lifesaving and first-aid techniques. A command post was set up at each disaster site. These varied as to how elaborate they were, based on the equipment available. Characteristic, however, was the one at Lakeside Park. A message center was set up with short wave radio communication to the supporting hospitals and the Alameda–Contra Costa Medical Association disaster center. The telephone company ran in an emergency line, but it was soon swamped with calls. A loud speaker system helped to direct local activity. Subchiefs for supply and transportation assumed their duties. Statistics on available hospital beds were rapidly gathered and kept current during the exercise. Casualties were rapidly treated and loaded on trucks to be transported to designated hospitals.

The hospitals were alerted shortly after 6 p. m. and began calling their disaster teams. The methods for notifying personnel to report to the hospital varied, but generally each department head or his representative on duty was responsible for calling in members of the department. Doctors were called either by a special message center operator or by notification of the local telephone answering service which called doctors on a previously prepared list. In a disaster of this magnitude, notification of personnel would not be necessary for they would be immediately aware of the need and report to their stations for duty. However, means for assembling people in case of small scale disasters should be ready.

The individual hospital plans varied from four pages of brief description and diagrams to small volumes. The way the hospitals approached the problems also varied. Some played it "cold" with no prior warning or preparation by the general staff. Others had elaborate previous drills and critiques so that a smoothly working organization was ready. Also, the extent of play varied. One hospital handled 500 casualties, going only through the triage phase. Others went to the "dirty sheet" stage, setting up operating rooms, simulating infusions and transfusions, and holding time schedules as close to the actual as possible. Some received only a few casualties to try out their flow systems, and others handled casualties almost equal to their total bed capacity.

Hospital plans are not part of this discussion, so let us proceed to the activities at the Alameda–Contra Costa Medical Association command post. The first problem was that of communications–setting up a message center to handle both radio and telephone messages with runners locally. Concurrent with this was the dispatching of the small army of observers and preselected monitor umpires. Since both of these groups reported to the headquarters at the very beginning of the exercise, it was possible with use of an outdoor public address system (there were too many to handle adequately inside) to give last-minute instructions as to what was expected of them. Each person was given a pin-on identification tag which indicated by color and nomenclature whether he or she was an observer or a monitor-umpire. Each was also given a form to fill out on his observations and criticisms. The observer's form was a single sheet asking for constructive comments on the exercise and indicating the observer's name, position, and area and/or hospital observed. The monitor-umpire form consisted of seven pages of mimeographed questions (79 in all) covering the many aspects of hospital operations in the care of mass casualties. These persons were transported to their destinations and back by Navy buses and cars furnished by the Association's women's auxiliary. The bicounty command post had established a "control board" composed of representatives of the various disciplines involved in the medical and health control activities. A veterinarian, dentist, pharmacist, mortician, and public health officer were on the board. Technical questions arising during the exercise were referred to the specialists involved. Problems on whole blood, narcotics, disposition of the dead, and similar items were consequently handled with dispatch at the command post. By adequate preplanning, disposition of the dead was adequately cared for from the legal standpoint. Under an over-all coroner coordinator, deputy coroners previously assigned were stationed at respective disaster sites and hospitals.

At the command post, a running record of the bed census was kept and coordination of the blood supply was carried out. Also, several preplanned special situations were initiated. One of considerable interest was the transportation by Army helicopter of blood and a neurosurgical and vascular team from central Oakland to an outlying hospital and the return with a load of casualties.

Results

Now, what were some of the lessons learned? Most important was the lesson learned by each participant of what such a situation might be like and what role he could play so that the next time he would do it with less confusion and better. For example, the registrar at one triage area had nice tables and chairs set up so that the casualties could come up to her desk and be registered; she had to be told that she should go to these litter cases instead of their going to her.

The procurement of casualties is vital to such a problem. Boy Scouts were our best source. They played their parts well, and their enjoyment and enthusiasm stimulated all who came in contact with them. They unanimously considered it a "blast" (not in the atomic sense) and were generally sorry when it was over. Doughnuts and cider or coffee served by the hospitals were joyously received and helped to provide fond memories and repeat volunteers. Also, their used dressings and emergency tags were cherished souvenirs.

Ambulant patients at the Veterans Administration Hospital and the Oak Knoll Naval Hospital provided these plans with casualties. Organizations participating in the community function as a group were another good source of patients. One such, the "Chanticleers," a little theater group in Castro Valley, were especially good in not only furnishing numbers of patients but, as might be expected, playing their roles to the fullest as psychopaths, dead and dying, and persons in pain. Moulages added to their reality, and some wore old clothes over bathing suits so that the clothing might be actually cut away to treat their extensive injuries. Also in evidence were families of hospital personnel, and one county hospital recruited 200 casualties from such a source. The families of participating doctors were poor sources of casualties, but the most unreliable of all were civil defense volunteers who had signed up ahead of time to act as casualties. At one disaster site, only 6 of a promised 50

from such a source actually arrived at the hospital. Another source is the disaster-site personnel who, when the action at their posts slackens, can become casualties for the hospitals to work on. A lieutenant in charge of a group of sheriff's reserves became such a casualty involuntarily and was given the full treatment clear to the morgue, much to the enjoyment of many, before his boys unlocked the handcuffs which held him bound to the litter.

One of the outstandingly good lessons was the enthusiasm displayed by the participants. Many factors contributed to this. The type of exercise selected, an earthquake, made everyone realize the importance of what he or she was doing, for this might be for real tomorrow. A tornado would probably play the same role in the Middle West. Also, the play was not forced on anyone. Here was the opportunity for a coordinated effort, and everyone could play an important role as he saw fit. However, frequent meetings stimulated the laggards by showing what others were accomplishing and planning. Friday evening was selected as being the least inconvenient time for everyone. Its occurrence just before an A. M. A. convention assured us of observers of national importance and also helped to stimulate interest. The novel participation of a helicopter did the same, as did the assurance of photographic and news coverage. These, plus many little factors, stimulated an enthusiasm that was a pleasure to see and bespeaks well for future exercises.

Many specific deficiencies were brought to light. For example, the importance of alternates for commanders of the various units was brought out when one hospital coordinator declared himself a casualty. Some hospital elevators will not accommodate the civil defense stretchers. First-aid stations should be outside a hospital proper. Participants with specific jobs should have labels. Triage areas must be large enough. The physician in charge of triage must be one of the best-trained men in the hospital.

These and other points were brought out by the participants and the comments of the monitors. Within another month we hope to have put together scenes from this exercise with those of the previous movie on "Operation Pill Hill" to create an instructional movie for further training of our own as well as any other group which may want to borrow it.

We hope from these remarks that you may be stimulated to hold a similar test. Certainly one learns by doing, and nothing talks as well as actual performance.

OPERATION AFTA

John K. Hampton Jr., Ph.D., New Orleans

On the evening of March 21, between 6:30 p. m. and 1 a. m., Tulane University carried out a realistic drill exercise. During the afternoon of March 21 a symposium was held on disaster medicine and included briefing discussions pertinent to the exercise to be conducted that evening.

The purpose of the drill exercise was to provide a realistic situation for instruction of medical students in the principles of disaster medicine. Also, the resources of the campus were used to demonstrate the need for adequate paramedical services in carrying out a rescue mission. The exercise had been so designed that it would adequately test the facilities of a 200-bed Federal Civil Defense Administration portable emergency hospital which was on loan from Baylor University School of Medicine. Finally, such an exercise, carried out effectively, provided proper emphasis to the need for community preparedness.

Associate Professor of Physiology, School of Medicine, and MEND Coordinator, Tulane University.

The basis for the disaster was a simulated crash of an airplane of large size onto the campus between Richardson Chemistry Building and Richardson Memorial Medical Building. This crash occurred about 6:30 p. m., March 21, and caused "fire" and "physical damage" to both buildings. This warranted the assembly of search and rescue personnel and the mobilization of the emergency hospital. About 7 p. m., one-half hour later, a secondary "explosion" of the fuel system of the airplane caught accumulated spectators by surprise, creating an additional large number of injured. The "explosions" and the attendant "fire damage" were realistically portrayed by lighting, sound, and smoke-generating systems. About 150 casualties were created by the initial "crash" and about 350 by the secondary "explosion."

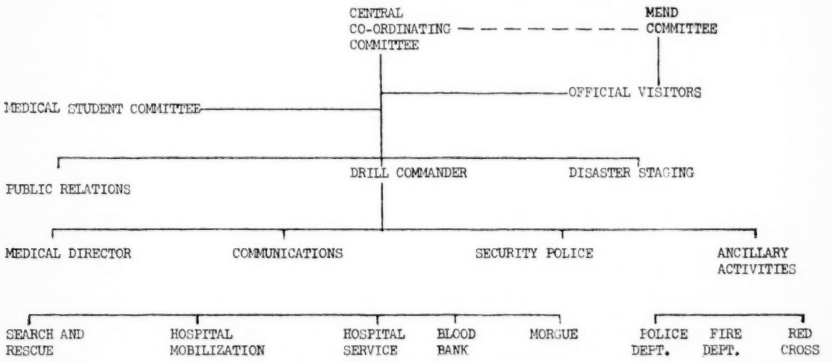
The casualty group was composed of approximately 200 students from the second and third year medical classes and approximately 300 from the general student body. These casualties had been

assembled earlier and their injuries realistically made up by modern casualty simulation techniques. The realism of these techniques was sufficient so that only by closest inspection could the lack of reality be detected. Portrayal of behavior appropriate to distress, emotional disturbance, and inability to speak and see was emphasized.

Upon notification of the disaster, the search and rescue mission was put into action. This group was composed of first-aid teams, the members of which were fourth year medical students, and litter bearers from first year medical class. Their duty was to seek out and administer appropriate first aid to casualties and to organize a system for transporting casualties from the point of injury to the emergency hospital. The emergency hospital was brought to the campus by a team of students who had been previously trained in its operation.

of clinical faculty members of the medical school who filled key professional positions. Most "physicians" were senior medical students, each of whom had a clinical advisor from the faculty. Nurses were recruited from the community, and each had a nursing student as a preceptee. Nurses aides were played by nursing students. Orderlies and ward men were selected from the first year medical class, and clerk-typists were selected from the student body and university clerical personnel. The hospital service personnel had all been assigned in advance, and each, according to the role played, had proper information supplied to study for his responsibilities during the drill exercise.

A minimum amount of "faking" of medical procedures was permitted. For example, patients going to surgery were properly prepared and draped and surgical staffs were scrubbed and gowned. The op-



Organization plan for operation AFTA.

The hospital is functionally packed in two large moving van trailers in color-coded boxes. The hospital consists of 200 beds (army cots) and has sufficient supplies to divide these into five or more appropriate hospital wards. Also, three surgical rooms, admission triage and first-aid facilities, clinical laboratory, and pharmacy and x-ray facilities are provided, and the hospital is equipped with central supply and sterile supply.

Upon receipt at the hospital, the patient was properly inspected and sorted according to the nature of his injury. Disposition of the dead took place in the morgue. Disposition of walking wounded persons who did not require hospitalization was effected by either self-help or minimum help, and such were immediately discharged from the triage station. Those requiring hospital admission were directed to the appropriate hospital unit, such as surgery or shock ward. The hospital was staffed by the hospital services group. This group consisted

erating room equipment was conventionally packed and sterilized and was not reused in the exercise without being repacked and actually resterilized. Bandaging, application of casts, and taking of x-rays were also carried out realistically. In addition, conventional civil defense emergency medical and hospital records systems were employed throughout the exercise.

Since the exercise was carried out as a university function, its program was under the administration of a central coordinating committee. The general organization can be determined by reference to the figure.

All participants in the exercise wore appropriate identification. However, observers to the drill exercise were encouraged. Uniformed cadets of the ROTC program served in a security policing system which provided actual patrol of the campus for misdemeanor or misbehavior and established a se-

curity policing system for the drill exercise itself. The latter consisted of a cordon of traffic lanes and the security of the disaster and hospital areas. Thus, persons without proper authority to enter the restricted areas came under control of the security police. A communications system was also set up to provide adequate contact between all units. Several students who were experienced amateur photographers were assigned to take extensive documentary photographs during the drill.

THE PROFESSION'S CIVIL DEFENSE RESPONSIBILITIES

Gunnar Gundersen, M.D.

It is an honor for me to participate in this civil defense conference, and I am delighted that you invited me. I always consider it a pleasure to meet and talk with dedicated individuals. Yes, I think of you as dedicated—serving a cause in which the American people generally are complacent and apathetic. And, I'm sorry to say, many medical and health personnel share this complacency and apathy. But you, by your very presence here, demonstrate that you are indeed laboring in the service of mankind.

One of my last duties as president-elect of the American Medical Association was to address the Sixth Annual National Medical Civil Defense Conference in San Francisco sponsored by the A. M. A. Council on National Defense. It is at meetings such as that one—and this one here today—that the responsibility of the medical profession in civil defense affairs is manifested. And that is what I want to talk about briefly today—the medical profession's civil defense responsibilities.

The diligent and sustained work which is being given to civil defense by the A. M. A. is not a new activity of organized medicine. Nearly 13 years ago, the A. M. A. appointed a special committee to study emergency medical services during war or grave national emergency. The medical profession was aware of the problem and alert to the need for its solution fully five years before the federal government enacted civil defense legislation.

The Association is most fortunate in having such experienced and energetic physicians to serve on the Council on National Defense and its Committee on Civil Defense. Through them, the Association has followed a positive, realistic, and sustained policy of active participation in medical civil defense affairs.

The 85th Congress provided for greater federal leadership and financial assistance to the states in the development of civil defense plans and preparations. The change in the declaration of policy in the Federal Civil Defense Act to make the responsibility for civil defense a joint one between the federal government and the several states and their political subdivisions is indeed a long-awaited and much-advocated step in the right direction. But, of course, only time and future meetings of Congress will determine its implementation and consequent effectiveness.

President, American Medical Association.

Mass Emergency Care

Meanwhile, the average individual physician and his role in the larger civil defense picture is of paramount importance. Usually, a physician thinks of emergency medical care in terms of treating one person. However, it seems to me that if the profession is to discharge its responsibility effectively in any disaster situation the thinking of such physicians must be reoriented. Medicine must think in terms of providing emergency service on a mass basis.

I know that your efforts have been in that direction. You know the value of proper collection, evacuation, sorting, admission, and reception of patients to medical facilities under disaster conditions. Each group involved in this process—the rescue and warden, transportation, and hospital clerical services—look to the physician for proper medical guidance in their work. Physicians who work with such groups are rendering services equally as valuable as the surgeon in the operating room. All are important members of the medical team.

Medical service rendered in an emergency differs from that in civilian practice. The assignment of priorities for care is a most important medical duty. As such, it should be performed by the most experienced physician on the scene. Here judgment must be exercised to a degree the physician seldom is called upon to make.

How can he gain experience? Certainly he must be trained before a real emergency occurs. Therein lies the value of test operations, dry runs, or CPX's. I was most gratified to learn that one feature of this two-day program was the reports on the experience gained from three test exercises. Simulated disaster conditions, such as in those test exercises, offer a variety of medical and surgical problems that will test the physician's judgment. This is most important, as improper sorting can lead to inadequate medical service.

As you know, every effort must be made to give the best possible medical care under the existing circumstances. This is difficult, because in disaster large numbers of patients urgently require the services of too few medical and allied medical and paramedical personnel, inadequate facilities, and too little equipment and supplies. Nevertheless, the physician must do all he possibly can for each patient. Therefore, the responsibility of the medical profession is to accomplish the greatest good for the greatest number within the framework of sound medical and surgical techniques. This can be done if the physician works calmly and efficiently. But to do this he must be trained in advance of the event. The profession's ultimate responsibility is its own preparation to meet the emergency.

Thus, the thinking of many physicians must be reoriented if the profession is to discharge efficiently its civil defense responsibilities. They must be cognizant of their responsibility for the total care of all the wounded or injured patients.

I believe that it is you who must inspire, convince, cajole, or prod other members of the profession to accept their responsibility in any emergency situation. It is only by the establishment of a broader base of participation by the profession in civil defense affairs that medicine will not be found wanting when disaster strikes.

Natural Disasters

And disaster does strike. I speak now not of the nuclear or thermonuclear holocaust but of natural disasters. In the past few years our civilian population has experienced an increasing number of natural disasters. Floods, fires, explosions, tornadoes, and other disasters have occurred in all parts of the United States, causing death and injury to many persons. Usually, the local communities or large geographical areas have floundered under the impact of the disaster.

One insurance company reports that natural disasters were responsible for more than a third of the deaths in catastrophes—accidents in which five or more persons died—during 1957. Deaths in catastrophes in the United States totaled almost 1,700 during that year, or about 400 more than in 1956. The increase was largely a reflection of the unusually heavy loss of life in hurricane Audrey, which caused about 350 known deaths early in June, 1957, most of them in Cameron, La.

In addition to the hurricane, there were four other major catastrophes—those which caused at least 25 deaths—during 1957. Fire destroyed a home for the aged at Warrenton, Mo., causing 72 deaths; a tornado struck the Kansas City area killing 39 residents; a gas explosion killed 37 men in a coal mine near Bishop, Va.; and a March blizzard killed 29 persons in the Great Plains states. As a result of these four disasters and hurricane Audrey, the loss of life in natural disasters during 1957 was the highest in nearly 20 years.

Many costly but important lessons have been learned as a consequence of these disasters. We know now that the communities that had adequate medical and hospital disaster plans were prepared to cope with the disaster more quickly, effectively, and efficiently than the communities without adequate plans. Those with partial or incomplete plans, although inadequate, fared better than the communities without any plans or preparation.

Leadership of the Physician

These disasters have clearly demonstrated the paramount need for preplanning and preparedness. They have shown that hospitals, physicians, paramedical personnel, and others must cooperate and function as a team. They have shown that a team plan requires close coordination and integration. But, most importantly, disasters have shown that a team needs leadership.

I believe that every physician has a responsibility to prepare himself and to participate in disaster planning in his community. Nurses, paramedical personnel, hospital clerical personnel, ambulance drivers, rescue workers, and others will look to the physician for guidance in the performance of duties in the disaster situation. It is the physician who must coordinate the activity of these persons. The physician must weld them into an efficiently functioning medical team. This means, of course, that the physician must enlarge the scope of his thinking and responsibility. He can no longer confine himself to the narrow sphere of his own professional problems. He must furnish guidance to health and medical and ancillary personnel that will assure optimum participation and results.

And again we come to the question: how can this best be done? I say it will be done when the physician recognizes his responsibility. So, again, I ask you who are today the dedicated people of the profession in civil defense to go back to your home towns and inspire, convince, cajole, beg, or prod the members of the profession to accept their responsibility.

NATIONAL SHELTER PROGRAM

Paul S. Parrino, M.D., Battle Creek, Mich.

This statement on the national shelter program will be presented primarily as it relates to our interests as medical people. But I would like to begin with a brief summary of the latest official statement by the Director of the Office of Civil and Defense Mobilization on May 7, 1958. Governor Leo A. Hoegh outlined five things which the administration will do in connection with the "National Policy on Shelters."

First, it will try to bring to every American all of the facts as to the possible effects of nuclear attack. It will try to inform every American of the steps which his state, his local government, and he can take to minimize these effects. To do this, it will expand substantially defense programs for information and education.

Second, the administration will itself initiate a survey of existing structures on a sampling basis. This survey should enable it to assemble definite information on the capabilities of existing structures to provide fall-out shelter. There are many facilities, especially in larger cities, and in mines, subways, tunnels, and cyclone cellars, which already afford some fall-out protection. It is necessary to determine accurately how much protection they afford in order to be able to use them properly.

Third, the administration will accelerate research to show how fall-out shelters can be incorporated in existing or new buildings and will work to design types which are most economical and most effective.

Fourth, the administration will, as soon as funds are available, construct prototype shelters suitable for different geographic areas and for different climates. It will test the prototypes through actual occupancy by people and through incorporating such shelters in underground parking garages, understreet shelters, subways, schools, hospitals, industrial plants, commercial buildings, family residences and apartments, and other buildings in the several states.

Fifth, the administration will provide leadership. It will set the example by incorporating fall-out shelters in appropriate federal buildings yet to be built.

The strong emphasis on shelters to provide protection from radioactive fall-out is extremely satisfying to the Biophysical and Medical Sciences Office. We are keenly aware of how much of a hazard radioactive fall-out can be with thermonuclear weapons. We have estimated how tremendously fall-out could increase our medical case load in the immediate and longer range postattack period. And we welcome anything which will help lessen the possibilities of such a load.

Acting Director, Biophysical and Medical Sciences Office, Office of Civil and Defense Mobilization.

Background

Our concern about the hazards of radiation goes back to the days of the old Health Office under the Federal Civil Defense Administration. As far back as 1952, technical bulletins were published entitled "Emergency Exposures to Nuclear Radiation" (TB-11-1) and "Emergency Measurements of Radioactivity in Food and Water" (TB-11-9). But radioactive fall-out first became a matter of real concern in 1954, and it was then that the desirability of providing cover or shelter from it was pointed out. Basement shelters and underground shelters with 3 ft. of earth cover were recommended (see Annual Report, 1954, page 113).

Early in 1955, information was released that new high-yield weapons produced radioactive fall-out that was dangerous hundreds of miles from the blast. It made it evident that protective construction had to supplement evacuation both in target cities and in fall-out areas. The fall-out hazard forced us to a new approach to shelter design because of the probability that people would have to stay in shelters for several days instead of for a few hours. Minimum space allowances were increased from 6 to 10 sq. ft. per person; ceiling heights were raised; doors to keep out radioactive dust were added; and filtered mechanical ventilation entered the picture (see Annual Report, 1955, page 132).

In January, 1956, the National Bureau of Standards began a study of the attenuation of nuclear radiation by shelters. In June, 1956, the American Machine and Foundry Company began to design a 150-ft. span, reinforced-concrete dome shelter with the capacity to house about 3,000 persons for several days or longer.

With this project, the Health Office became greatly interested in the health and medical requirements to maintain the physical and mental health of those who might need to stay in such a shelter. Attention was focused on space needs for dormitories, toilets, recreational and work activities, and medical and other facilities. Attention was given to the kinds and amounts of various equipment and supplies that would be needed, including not only first-aid and other medical supplies but garbage and trash containers, disinfectants and detergents, chemicals for toilets, soaps, and a whole miscellany of essential sanitation supplies. Water requirements were planned on an austere basis for adults and also for infants and young children.

The earlier technical bulletins were revised, and a special one on "Protection Against Fallout Radiation" (TB-11-19) was issued. The Health Office worked closely also with the Engineering Office, which also issued a technical bulletin relating to "Shelter from Radioactive Fallout" (TB-5-2, revised 1956). This describes protective measures for persons 15 miles or more from a potential target. It describes basement shelters, pipe shelters, ditch shelters, and culvert shelters. It discusses temporary family shelters and permanent group shelters. In May, 1958, the Engineering Office put out an eight-page technical bulletin on "Family Shelters for Protection Against Radioactive Fallout" (TB-5-3). As family men, you may be interested in seeing this bulletin. Copies are available.

This bulletin provides guidance to engineers, architects, and contractors, as well as the general public, in planning family shelters for protection against the effects of radioactive fall-out beyond the blast range of nuclear explosions. It suggests the advisability of planning for a two-week occupancy, even though in many areas radiation levels may permit leaving shelter after two or three days. It sets up a minimum desirable standard of at least 12½ sq. ft. of floor area per each occupant and 80 cu. ft. of volume. It gives desirable standards for shielding, ventilation, radio equipment, food and water supply, sanitation, and miscellaneous supplies. It shows three types of family shelters: (1) outside underground, (2) basement, and (3) above ground. It even tells where to buy ventilating equipment.

Present Plans

Our Engineering Office is at work developing and improving designs for fall-out shelters. There is no claim that any of these are perfect, but all are in process of being bettered as much as can be. These plans include improvised basement fall-out shelter, basement family fall-out shelter, family fall-out shelter, group fall-out shelter, industrial shelter, underground garage shelter, highway fill shelter, and subway tunnel shelter.

Now everyone feels that the Biophysical and Medical Sciences Office has a paralleling and collateral interest in the protective shelters which the Engineering Office is in process of designing. The health and medical interests must be factors in that design in order to ensure that people come out of those shelters alive, well, and able to function.

As we see it, it is necessary to explore the medical aspects of shelter living. This includes the biological, physiological, and psychological factors involved in living in shelters. This is necessary in order to know the vital and immediate medical problems that might arise in shelters. We need to know the effects of group living in close space for long periods of time. We need to know how the vital air components in the shelter may affect the health and life of persons confined there. We see studies here involving temperature, humidity, oxygen depletion, carbon dioxide concentration, and human exudation of moisture and odor. We need to plan for medical care for shelter inhabitants. We must determine the medical requirements for sick and injured in shelters. And we need to determine requirements to prevent and control the spread of communicable diseases in shelters.

We are aware of the fact that there might not be professional medical personnel in every shelter. Therefore, we must determine how much knowledge, skills, and abilities beyond the level of first aid we ought to disseminate among the general public so that they can do what they need to do in order to survive in the shelters. We need to know what medical and other supplies need to be put in the various shelters.

Acting on this conviction, the Biophysical and Medical Sciences Office has proposed a whole range of projects for research and development. Two of these relate to "Immunization for Shelter Occupants" and "Nutritional Requirements for Shelter Habitation." A dozen more will have angles more or less relevant to shelter inhabitants, although we consider them as more general health and medical projects. The list includes studies on the simplified treatment of burns; accelerated treatments of trauma; techniques for treatment of sick patients with a combination of burn, trauma, and radiation; rapid identification of biological warfare agents; evaluation of biological warfare decontamination procedures for skin, clothing, household effects, and physical environment; development of methods and chemicals to retard decomposition of dead bodies; control of insect and rodent vectors of disease under emergency conditions; biomedical effects of radiation and methods for decontamination of such radiation effects; underground storage problems with medical items; the missions of specific medical care facilities; management methods for shelter medical care facilities; and food supplements and food substitutes.

Public Education

Also related to shelter habitability, as well as to the general problem of health preservation under civil defense conditions, is a proposed project we are considering for education of the general public to a higher level of health and medical competence.

We feel that the general public should understand the nature and impact of fall-out and that it should see the reasonableness of the need to go into and to stay in shelters. It should be aware of the fact that, quite possibly for the entire length of stay in the shelter, people will need to take care of themselves, especially in the medical field. There just cannot be sufficient medical professional personnel to cover all shelters—especially small family shelters.

We feel now that it is of vital importance to strengthen public medical and health education in several areas, so that people can save life and maintain health among those near and dear to them in the absence of doctors or nurses. We feel, therefore, that more people should be educated—perhaps one in every family—to observe evidence of illness and/or to give care in such cases as heart disease; convulsions and epilepsy; diabetes, coma, and shock; communicable diseases; diseases due to poisons, chemicals, or physical agents; infections; and other diseases.

More persons should be taught nursing procedures and practices such as determination of temperature, pulse rate, and respiration; bed making; comfort devices and improvisations; elimination needs; lifting and transporting patients; food, feeding, and nutrition; and administration and side-effects of medicine. They should be taught nursing treatments such as enemas; steam inhalations; wet dressings, hot or cold; irrigations of eye, ear, and throat; surgical dressings; oral hygiene; and oxygen therapy.

They should be taught emergency treatment and care of open cuts and wounds; fractures, sprains, and dislocations; bruises; pressure or crushing injuries; concussion or other head injuries; hemorrhage, external and internal; burns; shock; radiation sickness; illness from fatigue, exposure, or overcrowding; childbirth; and medical and surgical complications.

More persons could be taught such managerial aspects of emergency defense medical facilities as organization for emergency care, assigning and directing others, supplies and equipment, emergency supply materials, and improvisations.

We believe these things fit right into the first point that Governor Hoegh made in his "National Policy on Shelters." This type of education in the medical area is part of what every American should know to minimize the possible effects of nuclear attack on human life and national health. It certainly will make easier his survival both in shelters and afterward when he comes out.

RESUSCITATION TECHNIQUES

Robert A. Hingson, M.D., Cleveland

During 1958, 40,000 people will be killed on the highways of the United States, 6,500 will drown, and 13,000 will die from industrial accidents and asphyxia. It makes no difference whether the injuries involve three patients in a highway accident from a 200-horsepower collision or a half million from a megaton nuclear explosion; the victims must be treated individually, promptly, and intelligently. The survival of the victims concerns us far more than the disposition or the census of the fatalities.

Of equal significance is the fact that this large number of lethal casualties represents only the apex of a much broader pyramid projecting geometrically an astounding toll of severely injured, yet salvable, patients.

Physicians frequently witness physiological asphyxia as a terminal state of debilitating physical illness. In such a setting, the asphyxial state is usually irreversible and the physician cannot correct it. In contrast, acute asphyxia frequently occurs in healthy individuals in whom physicians, or anyone else with the proper equipment and the ability to use it, may prevent a fatal outcome. This reversible type of asphyxia may result from the birth process (asphyxia neonatorum), high altitude, carbon monoxide, noxious gases, industrial or martial blast injuries, submersion, electrocution, conflagration, mechanical obstruction, or surgical anesthesia. The annual death rate from acute reversible asphyxia is conservatively estimated at 50,000.

The treatment of acute asphyxia and respiratory arrest is as definitive and clear-cut as any procedure in medical science. Fundamentally, this involves clearing the airway and intermittently introducing oxygen or air into the trachea under controlled pressure.

The Physician's Responsibilities

As a member of the rescue team in the treatment of mass casualties with many severe injuries resulting from warfare or peacetime industrial or transportation disasters, the physician in each specialty has major responsibilities:

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First, he should work in close liaison with his surgical colleagues in correlating his activities in such a manner that the maximum number of victims will be prepared in proper sequence for surgical restoration and mobilization and transport to receiving centers. Certainly, the physician should not waste his talents relieving pain in the dying when surgeons need him to prepare the salvable victims for field surgery or transport to receiving hospitals and permanent installations. The rescue physician, too, should understand full well the meaning of triage. As a member of the team, his services are supporting and ancillary during active surgery. However, because of his special knowledge gained from a career in general practice or in the front-line of the operating room, when he is alone he might be called upon to act as both surgeon and anesthetist. Probably the general physician or anesthesiologist is better able to render total emergency surgical service than his surgical specialty colleague, since anesthesia is essential as the first prerequisite for operation. The treatment of shock, the control of hemorrhage, the transport of the injured, and the surveillance of the recovery room for 1 or 100 patients represent the areas in which he has had daily experience.

Second, the physician, in his role as guardian of the functions of the brain stem, should devote proper priority to the restoration of physiological oxygenation to victims of smoke, blast, strangulation, and obstructive asphyxia. Today it is possible to prescribe oxygen from the physician's satchel as readily as the less helpful but more dramatic intracardiac administration of epinephrine or intravenous analeptic therapy. The introduction of the Western Reserve Anesthetic machine, oxygenator and resuscitator, and escape ventilator can truly dispense oxygen from the lifesaver's pocket.

For the first time, the use of intelligent oxygen therapy in the treatment of asphyxia is possible by the layman who can be taught to maintain a clear airway in the unconscious patient and rhythmically squeeze the oxygen rebreathing bag with equipment having a total weight of less than 2 lb. This type of resuscitation can also be carried out by the use of the Denmark Schuyler resuscitator, with use of the portable nonrebreathing Ruben valve.

The misconceptions concerning adequate artificial respiration techniques championed for years by the American Red Cross and Army rescue and Boy Scout manuals have resulted in needless deaths. These have finally been exploded with proper documentation by Peter Safar of Baltimore through the introduction of double airway for both adult and infant mouth-to-airway rescue techniques. Historically, they were also championed by both Elijah and Elisha in the Bible and by Professor Yandell Henderson of Yale University. We have applied these methods with success already documented in treating both cardiac standstill and respiratory standstill. Furthermore, in our monthly lifesaving courses at Western Reserve University, under the sponsorship of the Cleveland Heart Society and Drs. Claude Beck and Robert Hosler, we have taught others these techniques for the past nine years.

The fundamental principles are as follows: 1. The normal heart wants to beat if provided with oxygenated blood. 2. Once the alveoli of the lung in respiratory arrest are properly inflated with 100% oxygen, the respiratory crisis is over. A free volume gallon of oxygen comfortably contained in a pair of adult human lungs will be sufficient to sustain life for 16 minutes. One free volume gallon of air in the lungs sustains the same person for less than three minutes. 3. Even though the epiglottis is the watch-dog of the larynx, it must not be packed over the tracheal orifice by malposition of the head on the neck or by impaction of the mandible and supports of the tongue over the airway. 4. Hypoxia not only stops the motor but it wrecks the machinery, as postulated more than three decades ago by J. B. S. Haldane. It is essential for physicians to understand and to train others in maintaining an open airway in the unconscious patient. With so many thousand casualties possible from a single blast, the medical profession must adjust its sight to the atomic, hydrogen, and jet age.

Third, the physician must take cognizance of the fact that instantaneous, predictable, reversible, surgical anesthesia can be obtained for certain types of field emergencies with a single deep inhalation of 40% cyclopropane, 30% oxygen, and 30% helium in nonexplosive, prepackaged mixtures. The use of this type of anesthesia makes possible handling of large numbers of "walking wounded" by a single team in a single day.

Fourth, the place of the blood, plasma, and plasma substitute bank must be understood, planned for, provided, and utilized. On hand already is a plasma bank in the United States worth 35 million dollars in widely distributed warehouses. Yet, even closer than the plasma banks are the multiple liters of perfectly matched blood in the lower extremities of the victims; this blood can be readily called into the central circulation with autotransfusion by lifting the victim's legs to the "L" position. In hypovolemia and in hypotension related to shock and anesthesia, this simple maneuver is lifesaving, as I have documented through years of research and writing and, more recently, as Dr. Barney Greene of Brooklyn, N. Y., has noted in THE JOURNAL. The improved normetension thus developed can be prolonged by maintaining the "L" position in transportation of the injured and by ace bandaging, reverse wrapping, and snugly applied elastic stockings.

Finally, the physician must constantly seek to develop and intensify his understanding of physiology as well as pharmacology. He must remain resourceful, adaptable, companionable to both patient and surgeon, and compassionate in the application of both his humanitarian art and his scientific skills. He should share his knowledge in active programs of education of lay resuscitation personnel: civil defense teams, firemen, police, Red Cross workers, life guards, orderlies, military corpsmen, and Boy Scouts. For the past five years in Cleveland, I have had the privilege of directing such educational programs among all of these groups. It has been my experience that the physician can multiply his lifesaving service in major disasters through developing technical proficiency with understanding of principles among these groups.

Conclusions

Almost every day in our hospitals we apply these methods to patients who stop breathing or breathe too shallowly during an operation, to patients who have been relaxed and intentionally made apneic for electric shock for mental disease, and to newborn babies or to mothers who are sluggish in their breathing. Almost every day lives are sustained by an expert team of anesthesiologists who are at the same time testing and amassing data and lifesaving knowledge. This must be passed on to rescue squads at every police, fire, civil defense, and martial rescue station throughout America and our far-flung overseas bases, if any appreciable number of the thousands of people are to be saved who may, sooner than we think, have the wind knocked out of them in the oxygen desert of a nuclear or industrial blast. Oxygen sustains life. Oxygen saves life.

THE ROLL OF DENTISTRY IN CIVIL DEFENSE

Russell W. Bunting, D.D.S., Battle Creek, Mich.

In any medical preparedness program for national disaster, the development of allied medical personnel is a highly important consideration. If, as has been stated, a thermonuclear attack on the United States would involve millions of casualties and if the medical personnel itself will be decimated, it is obvious that there would not be enough duly qualified medical practitioners to meet this colossal task. It has long been recognized that there is an imperative need to develop and train all allied and paramedical personnel to assist physicians in the care of the injured in a major disaster.

This premise has been recognized and approved by the Office of Civil and Defense Mobilization and by leaders in medical civil defense, many of whom are participating in this conference. But, as yet, organized medicine has made no official statement to sanction or support such allied professional training.

This question has been raised by Major Gen. Silas B. Hays in the Sept. 20, 1958, issue of THE JOURNAL. In discussing the need for preparing paramedical workers he asks: "What is to be expected of these paramedical groups in a mass casualty situation? If the medical profession does not tell them, who is to? . . . These groups need guidance. Are they going to get it from the medical profession, or will they get it elsewhere? . . . I urge on American Medicine that this problem be faced forthwith and that a determination be made of the functions to be performed by the professions in emergencies which involve masses of casualties."

Although General Hays does not mention it in his article, I believe that the Medical Task Force on Personnel Training and Utilization, under the direction of Dr. Earle Standlee, is giving special consideration to paramedical training. They hope to define and to outline appropriate training programs for the various groups. This is most fortunate and may serve to dispel the uncertainties and misunderstandings that have existed in the past.

Of these professional allied medical workers in civil defense, I am here to represent the 90,000 dentists of the United States. For the past seven years, dentists have been placed in an equivocal position. They have been told that their basic medical training, their experience with handling patients in severe pain, and their cooperation with medicine in the care of their patients makes them high-priority professional personnel. This was shown in the recent wars when members of the dental corps

Dental Consultant, Office of Civil and Defense Mobilization.

of the armed forces gave valuable assistance to the medical corps in the care of the wounded and often rendered meritorious casualty care when no medical men were available.

Training

Granting the potentiality of dentists for emergency casualty care, the fact still remains that the average dentist needs training in the initial treatment of various types of injuries. He may have some academic knowledge of what should be done, but he has had no actual experience in the handling of massive hemorrhage, extensive burns, fractures of long bones, or other serious bodily injuries. If, at a time of extreme emergency, the dentist is to be of any assistance to the physician, he must have had some orientation in these unfamiliar services. Perhaps, for dentists more than any of the paramedical group, there is need for additional training.

The OCDM, the American Dental Association, and leaders in medical civil defense have recommended training of dentists for emergency medical services. Accordingly, organized dentistry has done what it could to prepare itself, in spite of the anomalous situation in which it has been placed—that of training in medical services which they, by law, are not authorized to perform. More could have been accomplished if all dentists had been assured of the validity of such training and the medical profession had given more active cooperation in affording it.

Training of dentists has been of three types: (1) organized courses for key dental personnel; (2) establishment of courses in training in local dental societies in all parts of the United States; and (3) first-aid and casualty care instruction to students in dental schools. These have been largely instigated and promoted by the Health Office of OCDM, in full cooperation with the American Dental Association.

In 1953 and 1954, two courses were given for dentists at Olney, Md., and in 1955 a course was given for a combined dental and nursing group at Battle Creek, Mich. These were highly successful and produced many outstanding leaders in dental civil defense. In addition to these, many dentists have attended casualty care courses given at Walter Reed Army Hospital and at Brooke Medical Center by the Army. At the present time the number of dentists applying for these courses far exceeds the quotas of OCDM and the A. D. A.

In almost every state, courses of instruction have been given to members of local dental societies. In these, large numbers of dentists have actively and enthusiastically participated. As a rule, the instruction began with the standard Red Cross first-aid course. This was followed by lectures and demonstrations on the initial care of injuries by members of the medical profession. In some places, arrangements have been made for dentists to observe in the emergency receiving rooms of hospitals.

Although the dental schools have had no DEND Program, similar to MEND, over half of them on their own have included casualty care training as a part of their regular curriculum. This, as a rule, has been provided by the Red Cross and by the staffs of the associated medical schools.

Responsibilities

Organized dentistry is keenly interested in civil defense and is willing to assume any reasonable obligations assigned to it. Knowing full well that the usual dental services, in the immediate postattack period at least, will not be required, dentistry is willing to devote its skills and training to any disaster service for which they are qualified. As allied medical workers, they realize their need for training and orientation in methods of casualty care. The only way they can get it is through the active assistance and instruction of local medical men.

In many places physicians have cooperated with local dental societies and have carried out excellent courses of training. In others, physicians have been apathetic and unwilling to give the time and effort to training dentists. Very often, medical men are willing but are uncertain as to what should be taught and how the material should be presented. So, many dental societies have wished to have such training but have been limited solely to Red Cross first-aid instruction.

If organized medicine really believes that dentists should be prepared to act as paramedical assistants in a national disaster, it should be willing to prepare them for such services. This training can only come from medicine. If the medical profession does not assume it, it will not be done.

Two courses of action are indicated: First, the task force should define the scope of emergency casualty care functions dentists should be prepared to perform. This then should be approved and adopted by organized medicine. Second, members of the medical profession should be urged to cooperate in teaching dentists, on the local society level, the principles of initial casualty care. In this there is need for a syllabus to outline the instruction for each type of injury for the benefit of the medical instructors. The OCDM has proposed the setting-up of a "workshop" to draft such syllabuses when and if the scope of such training shall be defined.

Of course, in the long-range postattack and reconstruction period, dentists will perform their usual services on an emergency level. For this they need no training. But, if they are to be of any real benefit in the immediate postattack period, they need training now. This can only be afforded by the medical profession.

THE CIVIL DEFENSE ROLE OF NURSES

Catherine M. Sullivan, R.N., Battle Creek, Mich.

In discussing the civil defense role of nurses, I would like to describe what their role should be, in event of attack, and report some of the things being done about it. We believe the role of the nurse, in the event of an enemy attack, will be to adapt comprehensive nursing care to the situation where the numbers of patients needing care and treatment will greatly exceed the number of professional people available and where supplies, equipment, physical facilities, and utilities will be limited. In such a situation, the civil defense nursing service mission is to provide nursing care to the sick and injured and to prevent and minimize illness and injury of the surviving population. Thus, there are two major civil defense nursing service programs—medical care and public health.

Medical Care Planning and Facilities

Medical care planning includes that for both casualties and noncasualties. (Casualty is the term used for those who are sick or injured as a direct result of enemy action; noncasualty is the term used for those sick or injured but not as a direct result of enemy action.)

Casualty care includes care for burns, traumatic injuries, radiation sickness, illness resulting from biological and chemical warfare, and shock. In planning our nursing care, we must remember that the patients will be of all ages and that many of them may have multiple injuries and complicating medical conditions.

Plans for civil defense nursing are based on the following principles: 1. Self-help. Everyone should know how to care for himself or herself. 2. Neighbor help. Caring for family, friends, and neighbors includes knowing how to stop a hemorrhage, to maintain a free air passage, to perform artificial respiration, to splint fractures, to dress wounds, to handle the sick and injured properly, and to know principles of sanitation and cleanliness. 3. Priority of care. To function effectively as members of the medical team, nurses must know, understand, and accept the philosophy of priority of care: to give the best to the most with the least and by the fewest. In order to practice this, the sick and injured will be sorted into the following treatment categories: minimal, immediate, delayed, and expectant. 4. Regrading (now called expanded functions). Present thinking is that nurses will function within the realm of nursing, and many medical leaders feel that more lives will be saved by good nursing care than by up-graded functions. Nurses, however, will have to exercise more independent judgment and will be working with less direct medical supervision. 5. Total nursing care. The professional nurse will be responsible for total nursing care. This includes lifesaving techniques, measures to alleviate suffering, measures to prevent further injury, and supportive care.

The noncasualty group is the normal incidence of sickness and injury which is aggravated and increased due to the chaotic situation. It includes accidents, acute illness, chronic diseases, and communicable diseases.

Professional nurses will be on the staffs of the following facilities: 1. Emergency treatment station. This will provide first-aid care to minimal, essential lifesaving surgery to immediates, and a "holding" facility for delayed and expectant categories. 2. Civil defense emergency hospital. This will provide emergency medical and surgical care to the surviving population. 3. Existing hospitals. These will be expanded two, three, or more times. 4. Other. Nurses will be needed if large groups of the sick and injured are transported to other medical facilities or if "medical communities" are established.

I have given a brief summary of the nurse's role in the civil defense medical care plan. With that as a background, one can easily categorize nursing responsibilities into clinical, management, and teaching.

Nursing Responsibilities

It is our belief that if we survive the initial post-attack period, the big problem will then be public health. This program will be responsible for the prevention, detection, and control of sickness and injury. It will include communicable disease control; prenatal and postnatal care; sanitation problems; contaminated food, milk, and water problems; and nutritional and emotional problems. Public health activities will function from established health departments and health centers. Reporting centers may be organized, and these, too, will require public health nursing service.

Professional nurses are prepared in many special fields of nursing, and this invites concern relative to assignment. It would be ideal if assignments could

Nurse Consultant, Biophysical and Medical Sciences Office, Office of Civil and Defense Mobilization.

be made according to specialized preparation, and this should be done if possible. However, probable assignments will be made according to (1) where the nurses are, (2) what needs to be done, and (3) what they can do.

In any type of disaster, a nurse should know how to determine priorities; to evaluate patient's condition, personnel needs, and personnel and equipment available; to assign, supervise, and teach effectively; and last, but very important, to improvise. She should know her resources and plan solutions which include modifying care, modifying procedures without violating basic principles, modifying supplies and equipment, and the knowledge and ability to reallocate functions.

Civil defense is nonmilitary defense. It is everyone's business and is a way of life and will be for sometime to come. In civil defense, nurses have a dual responsibility—that of a citizen and that of a professional person. They first must be aware of this challenge, next, accept it, and then do something about it through training and education. The nursing profession has actively responded to the challenge of civil defense. Many civil defense training and educational programs have been conducted by the professional nursing organizations, the military, the American Red Cross, civil defense organizations, and schools of nursing.

In January, 1958, the National League for Nursing initiated a project to demonstrate ways of preparing nurses for mass casualty care and other nursing roles in civil defense. This is being done with an $80,000 contract with the Office of Civil and Defense Mobilization. The objective is to determine curriculum content needed for all types of nursing education programs, including in-service programs in hospitals. Demonstrations will be carried out in three colleges offering different types of nursing education programs and in one civilian hospital.

Massachusetts General Hospital will develop content in disaster nursing for diploma and in-service education programs. Skidmore College Department of Nursing will work on content for basic baccalaureate programs, and Teachers College, Columbia University, will work on content for advanced nursing education programs. Curriculum content for basic collegiate and practical nurse education programs will be developed at the University of Minnesota. The 18-month project is an initial step in preparing a plan for nursing education in national defense.

THE NUCLEI OF LEUKOCYTES.—For some years our attention has been directed to another form of individuality of human blood, namely the specific patterns identifiable in the highly complicated morphology of the nuclei of polymorphonuclear leukocytes. . . . In the early days of descriptive hematology, much attention was paid to the form of the nucleus, but the older literature is largely speculative. . . . The best available studies in this domain are those which enumerate the lobes of the nucleus. The Schilling count and the Arneth count are numerical expressions of the degree of nuclear segmentation. It is known that in the bone marrow the degree of segmentation is less than in the peripheral blood, and it is widely believed that the degree of segmentation is an index of maturity. It is also known that segmentation is increased in certain diseases and decreased in acute infections as well as in certain families, notably those having the gene for the Pelger-Huetanomaly. It has been shown however by Turpin, that the lobe count is a measurable aspect of individuality. Some individuals have an unusually high lobe count under physiologic conditions throughout life; others show a persistently low lobe count. Of great interest too is the entirely inexplicable finding, . . . that in mongolism the lobe count is lower than normal. The lobe count is at best a crude representation of the prevailing form of leukocyte and takes no account of the remarkable intricacy of the chromatin arrangement and the rich variety of appendages and projections from the lobes. That these features are modified by physiologic and pathologic circumstances including acute infections and such metabolic disorders as megaloblastic anemias is well recognized, but it is probably true that a given subject retains certain specific nuclear appearances throughout life. Heredity is probably important. Whether these characteristics are as specific as a patient's facial appearance or his fingerprints, whether they are such as would divide subjects into categories in the same way as the ABO blood groups or whether they merely give quantitative information should be determined.—D. K. Briggs, M.D., The Individuality of Nuclear Chromatin with Particular Reference to Polymorphonuclear Neutrophil Leukocytes, *Blood,* October, 1958.

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DISASTER MEDICAL CARE

In this issue of THE JOURNAL are the papers presented at the Ninth County Medical Societies Civil Defense Conference held in Chicago on Nov. 8-9, 1958, and sponsored by the Council on National Defense of the American Medical Association. During the two-day conference, reports were presented on resuscitation techniques, shelter habitability, public health techniques for a nuclear age, reviews of three recent civil defense medical test programs, workshop sessions, and movies on selected subjects. This interesting program attracted representatives from 35 states and several foreign countries, and many important lessions were learned in the care of emergency medical services for large numbers of people.

Nearly every physician must ask himself the question how he would best function under conditions of disaster and what kind of medical care could he give. The threat of modern-day warfare with its capability of mass destruction of huge elements of our nation has imposed on the health professions a tremendous responsibility in the nation's efforts to survive. The saving of lives, particularly of those who can contribute to the survival effort, now assumes a new importance for the medical and allied professions.

A series of critical reviews of the types and the quality of medical care that was given after some disasters has not made pleasant reading. The sudden disruption of the normal well-ordered community life, a concomitant of all disasters, causes some profound changes in all aspects of life and seriously alters the environment in which medical care must be given. The variety of responses to meet these unpredictable events are conditioned by numerous factors. A small number of natural leaders emerge and give that steady and judicial leadership so vitally needed amid the chaotic surroundings. Experience and previous training are helpful and enable many to fall into routine patterns of action.

Physicians have been called on for exceptional and sustained effort after a disaster to assist the injured and the disturbed victims. Little training has been given in these fields of emergency medical care under traditional educational programs in the past, except the armed forces medical services. The ever-present threat of natural disaster has made physicians more aware of their obligation for this previously neglected field of medical care. Much has been learned from the experiences of industrial physicians, the armed forces medical services, and more recently civil defense medical organizations. The Council on National Defense, recognizing this trend, has recommended that its Committee on Civil Defense be renamed Committee on Disaster Medical Care, and the Board of Trustees has authorized the change. There has been an increasing number of papers published in THE JOURNAL and various specialty journals recommending sound scientific methods to be employed in emergency medical care.

The threat of nuclear attack and the ever-increasing improvement in weapon delivery systems have reduced the warning time and magnified the already complex and intricate problems of medical care in a thermonuclear age.

Eighteen months ago, the Federal Civil Defense Administration requested the American Medical Association to "recommend the planning, training and operational organization needed as a basis for a National Emergency Medical Care Plan for the treatment and care of casualties and noncasualties." The Commission created by the American Medical Association for this purpose, under the staff direction of Dr. Earle Standlee, is completing the final report to the Office of Civil and Defense Mobilization which will aid physicians in delineating their role in disaster medical care service. Developments in the field of civil defense have received renewed support and emphasis in recent months by the federal government, and the medical and health services are becoming more familiar with the detailed parts they are to play before, during, and after national emergencies.

The reports of this conference will enable physicians to give sound scientific medical care under conditions of austerity and disaster. Further study and observation will improve latent professional capabilities in providing any type of emergency medical care.

ORGANIZATION SECTION

NATIONAL CONFERENCE ON HOMEMAKER SERVICES

A National Conference on Homemaker Services, sponsored by the American Medical Association among 26 national, voluntary, and governmental agencies and organizations, will be held at the Edgewater Beach Hotel, Chicago, Feb. 10-11, 1959. Among the participants will be Dr. David B. Allman, member, Executive Committee of the Conference, Dr. Philip S. Barba, chairman, Finance Committee, and Dr. Lemuel C. McGee, chairman, Study Group on Industry and Labor and Homemaker Services. A number of other physicians and members of the Women's Auxiliaries will take part in the conference. Twelve study groups, which have held preconference discussions in the past few months, will prepare working papers for the meeting. These will serve as the bases for further discussion and for the formulation of plans to stimulate the development of such services and to strengthen the role of the voluntary agencies providing homemaker services throughout the country.

One significant development to be discussed will be of interest to all medical societies. It is the activity of the Passaic County, N. J., Homemaker Service which has been sponsored and supported by the local medical society of the state and which has demonstrated the effective role women's auxiliaries can assume in making homemaker services available to families in the community. Representation by all medical societies at the meeting is strongly recommended. Additional information regarding registration for the conference can be obtained by writing to the Council on Medical Service, American Medical Association, 535 N. Dearborn St., Chicago 10.

REPORT OF COMMISSION ON MEDICAL CARE PLANS

A limited supply of copies of Part 2 of the Report of the Commission on Medical Care Plans is available for distribution to physicians requesting single copies. This volume contains the "Statistical Appendices and Background Materials" to the commission's study. Requests for single copies should be addressed to Murray Klutch, Commission on Medical Care Plans, American Medical Association, 535 N. Dearborn St., Chicago 10. There will be no charge for single copies.

COUNCIL ON MEDICAL SERVICE

COMMITTEE ON MEDICAL AND RELATED FACILITIES

Study on Organizational and Professional Relationships Between Physicians in Private Practice and Those not in Private Practice.—The Committee on Medical and Related Facilities has undertaken a study of (1) the relationships of physicians in private practice to those not in private practice and (2) the growth and present status of public health services. At a recent planning conference it was decided that part one of the study should be concerned with the following physician groups not in the private practice of medicine: (1) physicians employed full time by official health agencies and other government services; (2) physicians employed full time by insurance companies, industries, pharmaceutical houses, voluntary health agencies, and research foundations; and (3) physicians employed full time in medical schools, hospitals, and other educational institutions.

More recently the Committee met with (group one) organizations representing full time public health physicians (i. e. American Public Health Association, Association of State and Territorial Health Officers, American Association of Public Health Physicians, and Public Health Service) to discuss relationships between these physicians and physicians in private practice. Part two of the study was also discussed and research methods evaluated.

A set of questions relating to the status of full time public health physicians in medical societies was sent to all county medical societies. The returns revealed that good relationships exist in most county medical societies. It is estimated that the study will take approximately one year during which time other conferences will be held and a number of national organizations visited by the staff.

MEDICAL NEWS

ALABAMA

Cancer Seminar in Birmingham.—The American Cancer Society, Alabama Division, Inc., will hold a Cancer Seminar Jan. 27-29, in Birmingham, in cooperation with the American College of Surgeons, Alabama Academy of General Practice, Jefferson County Dental Association, Jefferson County Medical Society, Medical Association of Alabama, and the Medical College of Alabama. Moderators for the three sessions will be Dr. Champ Lyons, Birmingham; Dr. John Day Peake, Mobile, president, American Cancer Society, Alabama Division, Inc.; and Dr. Joe Donald, Birmingham. Speakers and topics are as follows:

Cancer of the Breast, Dr. Alan Thal, Minneapolis.
Warts, Moles and Malignancy, Dr. George Andrews, New York City.
Cancer of the Head and Neck, Dr. Oliver Moore, New York City.
Radiation and Cancer, Dr. Milton Friedman, New York City.
Cancer of the Cervix, Dr. Herbert Schmitz, Chicago.
Chemotherapy of Cancer, Dr. Louis A. Leone, Richmond, Va.
Cancer of the Colon, Dr. Warren Cole, Chicago.
Cancer of the Prostate, Dr. W. W. Scott, Baltimore.
Cancer of the Lung, Dr. Thomas F. Nealon Jr., Philadelphia.

Question-and-answer periods will conclude each session. For information write Dr. Paul G. Reque, 601 Woodward Bldg., Birmingham 3, Ala., Program Chairman.

CALIFORNIA

Radiological Conference in Los Angeles.—The 11th annual Mid-Winter Radiological Conference, sponsored by the Los Angeles Radiological Society, will be held at the Statler Hotel, Los Angeles, Jan. 31-Feb. 1. Guest speakers will be: Dr. Peter Kerley, London, England; Prof. D. W. Smithers, London, England; Dr. F. N. Silverman, Cincinnati; and Dr. A. Finkelstein, Philadelphia. The conference fee of $20 includes two luncheon meetings featuring questions and answers. A banquet ($7.50 per plate) will be held Saturday evening, Jan. 31. For information and reservations, write Dr. Chester P. Bonoff, 1930 Wilshire Blvd., Los Angeles 57.

Dr. Mazia to Give Beattie Lecture.—Daniel Mazia, Ph.D. professor of zoology, University of California, Berkeley, will be guest speaker for the fifth annual Margaret Beattie Lecture presented by the Western Region of the American Association of Bioanalysts. He will address the Beattie dinner assembly Feb. 7 at the Clift Hotel, San Francisco, on "Biological Increase: The Life History of the Cell." The lecture series honors Prof. Margaret Beattie of the University of California School of Public Health "for her untiring efforts towards the elevation of standards and recruitment of clinical and public health laboratory personnel." The presentations are devoted to general subjects of pure science and are not restricted to methodology. Information on the dinner meeting may be obtained from William Reich, Walnut Creek–Lafayette Laboratories, 1409 Nursery Lane, Walnut Creek, Calif.

Annual Meeting in San Francisco.—The 88th annual session of the California Medical Association will be held Feb. 22-25 with headquarters at the Sheraton–Palace Hotel, San Francisco. Guest speakers will include Drs. Edwin B. Astwood, Boston; C. Rollins Hanlon, St. Louis; Donald L. McRae, Montreal, Quebec, Canada; and William Wallace Scott, Baltimore. Special guests of sections will be Drs. Warfield Garson, Chapel Hill, N. C., and Arthur Jones, Portland, Ore. The Cancer Commission of the California Medical Association will hold preconvention conferences Feb. 21, on which day five postgraduate courses will also be conducted. Dr. Francis E. West, president of the association, will open the general sessions Feb. 23 after which a symposium, "The Diagnosis and Management of Upper Gastrointestinal Bleeding," will be moderated by Dr. Edwin G. Clausen, Oakland. The second general meeting will be a tour of the Vallecitos Atomic Laboratory Feb. 24, with the president's dinner dance scheduled for that evening. A total of 14 symposiums and panel discussions will be presented. A motion-picture program is arranged for each day of the meeting. Scientific and technical exhibits and a ladies' program are arranged. For information write Mr. John Hunton, 450 Sutter St., San Francisco 8, Executive Secretary.

DISTRICT OF COLUMBIA

Nutrition Expert Dies.—Elmer M. Nelson, Ph.D., chief, Division of Nutrition, Food and Drug Administration, U. S. Department of Health, Education and Welfare, died suddenly at his home in Arlington, Va., Dec. 24. Dr. Nelson will be remembered for his contributions to the science of nutrition, his leadership in the regulatory labeling of nutritional products, and for his devoted service to the American Medical Association as a member of its Council

Physicians are invited to send to this department items of news of general interest, for example, those relating to society activities, new hospitals, education, and public health. Programs should be received at least three weeks before the date of meeting.

on Drugs. He became affiliated with the staff of the Food and Drug Administration in 1935 and that same year also was elected to membership on the Council. Dr. Nelson served continuously as a member of the Council up to the time of his death, not only as an expert on vitamin preparations, but also as a member and later chairman of the Council's Committee on Nomenclature.

ILLINOIS

Chicago

Laboratory for Exfoliative Cytology.—Establishment of the Comdr. Eugene F. McDonald Jr. Memorial Laboratory for Exfoliative Cytology at the University of Chicago Medical Center has been announced by Dr. Lowell T. Coggeshall, dean of the university's Division of Biological Sciences, who said that formation of the laboratory has been financed by leaders in the radio and television industry as a memorial to the late founder-president of Zenith Radio Corporation of Chicago. Executives and business firms in the radio-television manufacturing industry have contributed about $155,000 and contributions are still being received by the university. The new laboratory includes a suite of five rooms located on the second floor of the Mothers' Aid Research Pavilion at the Chicago Lying-In Hospital on the University of Chicago campus. The laboratory is designed to make examinations for gynecological, lung, and other forms of cancer routine. The staff of cytologists is under the leadership of Dr. George L. Wied, assistant professor in the department of obstetrics and gynecology.

MASSACHUSETTS

Study of Fatal Highway Collisions.—The project "Research on Fatal Highway Collisions" already under way at the Harvard Medical School Department of Legal Medicine, Boston, has been awarded a grant of $809,000 by the U. S. Public Health Service for a five-year period. Other assistance in the form of laboratory service has been given by the Suffolk County Medical Examiner's office and the Chemistry Laboratory of the Massachusetts Department of Public Safety. Research on Fatal Highway Collisions will begin at the scene of the accident after alert by the State Police and the Registry of Motor Vehicles. The area studied will include metropolitan Boston and Cambridge to Route 128. Interviews at the scene, police station, hospital, and home will be carried out immediately. Weather and other environmental data will be taken. A traffic engineering analysis of the location will be made. Data on living drivers will include physical examination, history, vision, audition, psychological testing, psychiatric examination, social and family history, employment, vehicle and court records. Data will be integrated to (1) describe the conditions under which fatal highway collisions occur, (2) identify causes, (3) develop preventive measures, (4) aid in the interpretation of evidence, and (5) facilitate police training. The investigating team will include a psychologist, forensic pathologist, forensic psychiatrist, attorney, statistician, automotive engineer, social worker, ophthalmologist, traffic engineer, and physician. For information write Alfred L. Moseley, Department of Legal Medicine, Harvard Medical School, 25 Shattuck Street, Boston 15.

NEW JERSEY

Jefferson Medical Center Organizes Asthma Unit.—The Betty Bacharach Home, in association with the pediatric, medical, and psychiatric departments of the Jefferson Medical Center, has organized a unit for the treatment of intractable asthma in children. Children with perennial asthma of more than one year's duration and who are refractory to hyposensitization and other forms of medical treatment are eligible for admission. Absecon Island, on which the home is located, is relatively pollen-free. All facilities, including schools, are available within the institution. Children from 5 to 15 years will be considered for admission. The Betty Bacharach Home will underwrite the cost for all children admitted. For information write to Mr. Simon Lippman, Executive Secretary, Betty Bacharach Home, Atlantic City, N. J.

NEW YORK

Capt. Calvy Honored.—The Stitt Award of the Association of Military Surgeons of the United States was presented recently to Capt. George L. Calvy, MC, USN, chief of medicine at the U. S. Naval Hospital, St. Albans, for his clinical research with antibiotics in combating staphylococcic pneumonia. This award, consisting of a bronze plaque, an honorarium of $500, and a life membership in the association, is made annually by the Pfizer Laboratories Division, Charles Pfizer and Company, Inc., of Brooklyn "for meritorious work in the field of antibiotics."

Medical Seminar Cruise.—The New York University College of Medicine Alumni Association will sponsor a medical seminar cruise aboard the M.S. Italia visiting San Juan, St. Thomas, Ciudad Trujillo, Cap Haitien, and Nassau, sailing Feb. 21 (Alumni Day) and returning March 8. The faculty will include Drs. Claude E. Heaton, S. Bernard Wortis, John H. Mulholland Jr., Robert S. Hotchkiss, Clarence E. de la Chapelle, William Goldring, and Saul Krugman. The seminar constitutes 30 hours of category I credit for members of the American Academy of General Practice. For information write Dr. William N. Hubbard Jr., Associate Dean, New York University College of Medicine, Room 164, 550 First Ave., New York 16.

Annual Heart Conference.—"Heart in Industry" will be the theme of an all-day conference at the Waldorf-Astoria, New York City, Jan. 27, held under the auspices of the New York Heart Association. This is the fifth annual all-day conference sponsored by the association and the second on the industry theme. Dr. Norman Plummer, medical director, New York Telephone Company, is chairman of the planning committee. Former Governor Thomas E. Dewey will be the luncheon speaker. Dr. Jere W. Lord Jr., president of the association, will preside. With Dr. Edwin P. Maynard Jr., chief attending physician, the Brooklyn Hospital, presiding, speakers of the morning session will include Dr. Lawrence Hinkle Jr., Dr. Herman K. Hellerstein, Dr. S. Charles Franco, and Mr. Roland Baxt, executive director, Federation Employment and Guidance Service, New York City. Dr. Maynard will also act as moderator of the morning panel discussion. Dr. Irving S. Wright, past-president of the American and New York Heart associations, will preside at the afternoon workshop panel session which will consider questions related to the problem of heart diseases. For information write the New York Heart Association, 10 Columbus Circle, New York 19.

New York City

Conference on Hair Growth.—The New York Academy of Sciences, Section of Biological and Medical Sciences, will present a Conference on Hair Growth and Hair Regeneration Jan. 31, beginning at 9 a. m. Dr. Robert L. Kroc, chairman of the section, will open the meeting. Fourteen papers are scheduled for presentation, with the following two by Dr. George E. Rogers, Commonwealth Scientific and Industrial Research Organization, Wool Textile Research Laboratories, Victoria, Australia: "Recent Results on the Fine Structure of Hairs and Hair Follicles" and "Newer Findings on the Proteins and Enzymes of Hair Follicles." Attendance is limited to those invited to participate in these conferences and to interested members of the academy. For information write Dr. Irwin I. Lubowe, 667 Madison Ave., New York 21.

NORTH CAROLINA

Seminar on Occupational Health.—The University of North Carolina School of Medicine will sponsor the sixth annual Seminar on Occupational Health, to be held in Chapel Hill, Feb. 6. Other sponsors include the Occupational Health Committee of the Medical Society of the State of North Carolina and the Liberty Mutual Insurance Company. Special invitations will be sent to doctors in Virginia and South Carolina. Speakers for the program are Mr. R. E. Gordon, industrialist, Asheville; Dr. R. W. Borden, Goldsboro; Irene D. Courtenay, R. N., North Carolina State Board of Health; Dr. Joe M. Bosworth, Atlanta, Ga.; Dr. B. Dixon Holland, Secretary, Council on Industrial Health, A. M. A.; Dr. Elva Burgess, Charlotte; Dr. Eugene Van der Smissen, Division of Radiological Health, U. S. Public Health Service; and Dr. Thomas B. Barnett, associate professor of medicine, University of North Carolina School of Medicine.

PENNSYLVANIA

Plaques for Centenarians.—Sixty residents of the Commonwealth of Pennsylvania who reached their 100th birthday during 1958 were presented with testimonial plaques by The Medical Society of the State of Pennsylvania and the society wishes to find out who will be 100 in 1959. Since 1948, when the presentations were inaugurated, The Medical Society has provided hand-lettered, framed centenarian testimonials for 391 residents of the state. The testimonials have been presented either by officers of the county medical societies or the personal physician of the centenarian. The records show that 75% of Pennsylvanians who live to be 100 are women. A testimonial plaque will be presented to any resident of Pennsylvania who attains the age of 100 "in recognition of one whose life span exemplifies healthful living." Name and date of birth should be sent to The Medical Society of the State of Pennsylvania, 230 State St., Harrisburg.

Philadelphia

Fellowships in Gastroenterology Available.—There are available at the Jefferson Medical College and Hospital two additional fellowships for graduate training in gastroenterology, Dr. C. Wilmer Wirts, associate professor of medicine has announced. Stipend is $4,500 per year, and U. S. citzenship and a minimum of two years of medical residency are prerequisites. For information and application, write to Dr. Wirts, Jefferson Medical College of Philadelphia, 1025 Walnut St., Philadelphia 7.

British Lecturer.—Dr. Thomas Bedford, director of the Medical Research Council's Environmental Hygiene Research Unit, London, England, will deliver a paper at the opening session of the 65th annual meeting of the American Society of Heating and Air Conditioning Engineers in Philadelphia, Jan. 26-29, on "Researches on Heating and Ventilation in Relation to Human Comfort." Dr. Bedford, who also is a special lecturer in industrial hygiene, London School of Hygiene and Tropical Medicine, will participate in a topical session on comfort. After the meeting, he will proceed to lecture engagements at the Naval Air Development Center, Johnsville, Pa., the University of Pennsylvania, Philadelphia, the University of Minneapolis, the University of Illinois, Urbana, and the Harvard School of Public Health, Boston. Before returning to England, Dr. Bedford plans to visit Cleveland and Chicago.

TEXAS

International Assembly in San Antonio.—The 23rd annual meeting of the International Medical Assembly of Southwest Texas will be held Jan. 26-28 in the Gunter Hotel, San Antonio. A one-day seminar Jan. 25 will be presented by the San Antonio Division of the Post Graduate School of Medicine of the University of Texas. Each of the following speakers will give three presentations:

Drs. Frederic C. Bartter, Bethesda, Md.; Thomas L. Ball and Margaret H. D. Smith, New York City; Charles M. Norris and Harry E. Bacon, Philadelphia; John F. Holt, Ann Arbor, Mich.; E. Grey Dimond, Kansas City, Kan.; William Boyd, Toronto, Ont.; Charles G. Johnston, Detroit; Frank Foster and Cornelius E. Sedgwick, Boston; Milton L. McCall, New Orleans; William L. White, Pittsburgh; Col. Benjamin H. Sullivan Jr., Washington, D. C.; Merrill J. Reeh, Portland, Ore.; Franklin G. Ebaugh, Denver; and Rubin H. Flocks, Iowa City.

Technical displays, entertainment, and a ladies' program are arranged. Registration fee is $20. For information and registration, write the International Medical Assembly of Southwest Texas, 202 W. French Place, San Antonio 12, Texas.

WISCONSIN

Bowling Tournament.—The third annual showdown of physician "pinblasters" in Wisconsin and their wives is scheduled for Saturday, Feb. 7, in Madison. There will be mixed doubles, two classes of men's singles, men's doubles, a men's team event, and the ladies' singles championship. Serving as hosts and hostesses will be members of the Dane County Medical Society and its auxiliary. Defending champions, expected back to try again, include Drs. John B. Baldi, Milwaukee, and A. J. Schmidt, Sheboygan, men's singles; Drs. C. M. Carney and Erv T. Rechlitz, Beloit, men's doubles; and Mrs. J. W. Boren Jr., Marinette, auxiliary singles queen. Mixed doubles and the team match will be new events in 1959. A party will conclude the weekend of bowling. For information write the State Medical Society of Wisconsin, Box 1109, Madison 1, Wis.

GENERAL

Health Forum Meets in Chicago.—The 1959 National Health Forum, sponsored by the 64 agencies of the National Health Council, will be held March 17-19 at the Palmer House, Chicago, Dr. Norvin C. Kiefer, president of the council, has announced. Dr. James H. Sterner, medical director of Eastman Kodak Company, Rochester, N. Y., is chairman of the committee planning the meeting. The theme for the forum is "The Health of People Who Work." Dr. Arthur S. Flemming, secretary of the Department of Health, Education, and Welfare, Washington, D. C., will be a principal speaker. The three-day forum will mark the eighth year the council has sponsored cooperative sessions for discussion of major problems affecting the nation's health. The National Health Council inaugurated the National Health Forum in 1952 as a vehicle to direct public and professional attention to major problems in the field of health, of common interest to its member agencies. For information write the National Health Council, 1790 Broadway, New York 19.

Report on Easter Seal Activities.—According to the year-end report issued by the National Society for Crippled Children and Adults, a record total of 246,562 persons were served in programs and facilities operated by Easter Seal societies or in co-sponsored projects during 1958. The 38-year-old organization, operating in all 49 states, the District of Columbia, Hawaii, and Puerto Rico, likewise reports that there have been brought into existence some 50 new centers and programs including rehabilitation and treatment centers, camps, nursery schools, and new and expanded programs within already existing facilities, bringing total Easter Seal projects to more than 1,400. Services include care and treatment for those with orthopedic disorders, cerebral palsy, arthritis, poliomyelitis, muscular dystrophy, and multiple sclerosis. Through the Easter Seal Research Foundation, founded in 1956, a total of $376,578.28 in 49 grants has been made to 34 basic and clinical research projects in 29 universities and colleges. Last year a total of 56 resident camps were operated by the societies and an additional seven were co-sponsored. Dr. Dean W. Roberts is executive director of the National Society.

Trauma Surgeons Meeting in Colorado.—The Rocky Mountain Traumatic Surgical Society will meet at the Hotel Jerome, Aspen, Colo., Jan. 28-31. A one-hour panel discussion on "First Aid to Injured Skiers" will be held the afternoon of Jan. 29, with an organizational meeting held that morning. Physicians from Colorado will include the following: Drs. J. Sterling Baxter, Robert Barnard, and Charles S. Houston, Aspen; John Leidholdt, Col. Robert Anderson, Sid Blandford, Ralph Stuck, John Freed, William Stanek, Hugh MacMillian, William Coppinger, Charles Gaylord, William Gobe, and Robert Dean, Denver; and Robert Hall, Grand Junction. Papers by other participants are:

Injuries to the Spleen and Their Treatment, Dr. Donald Davenport, Long Beach, Calif.
Traumatic Knee Problems, Dr. A. C. Buergler, Akron, Ohio.
Fluophane Anesthesia in Spinal Fusion, Dr. Paul Evans, Los Angeles.

A summary panel will conclude the scientific session, and a business meeting and election of officers will conclude the meeting. For informaiton write Dr. Robert R. Odén, 420 Hyman St., Aspen, Colo.

Meeting of Surgeons in St. Louis.—A four-day sectional meeting of the American College of Surgeons will be held in St. Louis March 9-12, with head-

quarters at the Kiel Auditorium and with many sessions scheduled also in St. Louis hospitals. The program will include hospital clinics, panel discussions, symposiums, scientific papers, technical exhibits, medical motion pictures, and cine clinics in general surgery and in the specialties of thoracic surgery, urology, gynecology and obstetrics, ophthalmic surgery, and orthopedic surgery. Dr. Frank McDowell, St. Louis, associate clinical professor of surgery, Washington University School of Medicine, is chairman of the local advisory committee on arrangements for the scientific program. Hospital clinics have been arranged by staff representatives in leading St. Louis hospitals. Participating in the hospital clinics will be Barnes Hospital Group, Jewish Hospital, St. Louis City Hospital, St. Louis University Hospital, St. Luke's Hospital, and Veterans Administration Hospital. The joint nurses program, an annual feature of this meeting, will include discussions on comprehensive care of the patient who has successfully undergone pelvic evisceration, open technique in the management of burns, congenital heart disease, and other problems. Special films and tours and demonstrations at local hospitals are planned. Dr. H. Prather Saunders, associate director, American College of Surgeons, is in charge of the Sectional Meeting for the college.

Meeting on Clinical Research in California.—The 12th annual meeting of the Western Society for Clinical Research will be held Jan. 29-31 at the Golden Bough Theater, Carmel, Calif. The president's address will be given the afternoon of Jan. 29 by Dr. Herbert N. Hultgren, San Francisco. On Jan. 30, an alternate session will be held at the La Playa Hotel. Of the 48 papers scheduled for presentation, the following will be introduced by members:

The Estimation of Erythrocyte Survival Time in Hemolytic Disease from a Single Sample of Blood, Jean C. Sabine, Harry Lee, Catherine A. Lambert, and Myron Pollycove, San Francisco.

Metabolic Changes Produced by Human Growth Hormone (Li) in a Pituitary Dwarf, Roberto F. Escamilla, John J. Hutchings, William C. Deamer, and Choh Hao Li, San Francisco.

Effects of Bromsulfalein on the Cardio-portal Circulation Time, Ismael Mena, Leslie R. Bennett, R. Wilbur Melbye, Los Angeles.

Nature of Acute ST Changes in Experimental Coronary Occlusion, Werner E. Samson and Allen M. Scher, Seattle.

Effects of Clinical Digitalis Levels on Rubidium Uptake of Red Blood Cells, Jerold M. Lowenstein, William L. Caldwell, and Grover Liese, San Francisco.

Ventilatory Response of SCUBA Divers to CO_2 Inhalations, Herman F. Froeb, La Jolla, Calif.

The annual business meeting will be held at noon, Jan. 31. For information write Dr. William N. Valentine, University of California Medical Center, Department of Medicine, Los Angeles 24, Secretary-Treasurer.

CANADA

Physicians Meeting in Banff.—The American College of Physicians prairie regional meeting for Manitoba, Saskatchewan, and Alberta, will be held Jan. 29 at the Timberline Hotel, Banff, Alberta. The program will open with an address by Dr. F. A. L. Mathewson, governor of the college for Manitoba and Saskatchewan. Eleven papers are scheduled for presentation, including "Surgical Indications in Peptic Ulcer," by Dr. Fuller B. Bailey, Salt Lake City, Utah, regent of the college. At the evening dinner session, Dr. Bailey will be the speaker, discussing "The American College of Phyicians." A program for the ladies has been planned. Chairman of local arrangements is Dr. Stephen B. Thorson, 216 Medical Arts Building, Calgary, Alberta, Canada.

FOREIGN

Symposium on Bacterial Resistance to Antibiotics in Italy.—An International Symposium on "The Prevention of Bacterial Resistance to Antibiotics" will be held in Perugia, Italy, May 1-3, sponsored by the Italian Society of Obstetrics and Gynecology. The general topics of the sections will be (1) problems related to bacterial resistance to antibiotics today and (2) how to prevent bacterial resistance. Original reports, either clinical or in the basic sciences, will be considered, with definite priority given to the following:

Antibiotic resistant organisms in a maternity hospital.
Antibiotic resistant organisms as the cause of infection obstetrical and gynecological departments.
Limitation of the use of antibiotics as prophylactic agents.
The newest antibiotic drugs; their use in emergency cases.

The official languages will be Italian and English. For information write: Segreteria del Simposio, Clinica Ostetrica e Ginecologia, Policlinico, Perugia, Italy.

Congress on Radiology in Munich.—The ninth International Congress for Radiology will be held in the Exposition Park, Munich, Germany, July 23-30, under the protectorate of the president of the republic, Prof. Dr. Theodor Heuss, and under the honorary presidency of Prof. Dr. H. Holthusen, of Hamburg, Prof. Dr. Boris Rayewsky, of Frankfurt, and general secretary Prof. Dr. H. v. Braumbehrens, of Munich. The new building of the German Roentgen Museum in Remscheid-Lennep will be dedicated in connection with this congress. The chief subjects of the scientific sessions will be: Intensification of Roentgen Pictures and Television in Roentgenological Diagnosis, Preoperative Irradiation of Malignant Tumors, Irradiation Exposure of the Population by the Medical Use of Irradiation, Automation and Automatic Diagnosis, Effect of Irradiation on the Metabolism and Cells, Chemical and Biological Protection Against Irradiation, and

the Tasks of Radiology in the Present Era. Diagnostic and therapeutic problems, questions concerned with nuclear medicine and therapy, and laws regarding radiology will be discussed. The address of the secretary of the congress is: München 22, Reitmorstrasse 29, Germany.

CORRECTIONS

Addiction to Freely Obtainable Drugs.—In the Foreign Letter item from the United Kingdom entitled "Addiction to Freely Obtainable Drugs," in THE JOURNAL, Dec. 20 issue, page 2173, it is stated that a patient took 160 ml. of Chlorodyne "or one-third of an ounce." This should have read "or one-third of a pint."

Histoplasmosis.—In the editorial on histoplasmosis in the Dec. 27, 1958, issue of THE JOURNAL, page 2272, the statement "the causative fungus . . . is found in the feces of birds . . . bats, dogs, and various other mammals" was based on a popular misconception. Although the fungus is found in the soil where such animals are found and the infection in man often follows cleaning hen houses or pigeon lofts, repeated attempts to isolate the fungus from feces of any of these animals have been unsuccessful. The fungus may, however, be found in lesions of various autopsied birds and mammals.

EXAMINATIONS AND LICENSURE

NATIONAL BOARD OF MEDICAL EXAMINERS

National Board of Medical Examiners: Part II only, April 21-22; Parts I and II, June 16-17; Part I only, Sept. 9-10. Examinations must be received at least six weeks in advance of a specific examination date. Examining centers established after close of registration. Exec. Sec., Dr. John P. Hubbard, 133 South 36th St., Philadelphia 4.

EDUCATIONAL COUNCIL FOR FOREIGN MEDICAL GRADUATES, INC.

Educational Council for Foreign Medical Graduates, Inc.: Stations around the world, Feb. 17. Deadline for foreign applications was Nov. 17. The following examination will be held Sept. 22 with application deadline of June 22. Exec. Director, Dr. Dean F. Smiley, 1710 Orrington Ave., Evanston, Ill.

BOARDS OF MEDICAL EXAMINERS

ALABAMA: *Written.* Montgomery, June 16-18. Sec., Dr. D. G. Gill, State Office Bldg., Montgomery 4.

ALASKA:* On application in Anchorage and Juneau. Sec., Dr. W. M. Whitehead, 172 South Franklin St., Juneau.

ARKANSAS:* *Examination and Reciprocity.* Little Rock, June 11-12. Sec., Dr. Joe Verser, Harrisburg.

CONNECTICUT:* *Regular. Examination.* Hartford, March 10-12. Acting Sec., Dr. Louis P. Hastings, 160 St. Ronan St., New Haven.

FLORIDA:* *Examination.* Miami Beach, June 22-24. Sec., Dr. Homer L. Pearson, 901 N.W. 17th St., Miami 36.

GEORGIA: *Examination and Reciprocity.* Atlanta, June. Sec., Mr. C. L. Clifton, 224 State Capitol, Atlanta 3.

GUAM: *Subject to Call.* Act. Sec., Dr. F. L. Conklin, Agana.

ILLINOIS: *Examination and Reciprocity.* Chicago, Jan. 26-30. Supt. of Registration, Mr. Fredric B. Selcke, Capitol Bldg., Springfield.

MAINE: *Examination.* Portland, March 10-12. *Endorsement.* Portland, March 10. Sec., Dr. Adam P. Leighton, 142 High St., Portland.

MICHIGAN:* *Examination.* Ann Arbor and Detroit, June 8-10. Sec., Dr. E. C. Swanson, 118 Stevens T. Mason Bldg., West Michigan Ave., Lansing 8.

MINNESOTA:* *Reciprocity.* St. Paul, February. Sec., Dr. F. H. Magney, 230 Lowry Medical Arts Bldg., St. Paul.

MONTANA: *Examination and Reciprocity.* Helena, April 7. Sec., Dr. Thomas L. Hawkins, 555 Fuller Ave., Helena.

NEBRASKA:* *Examination.* Omaha, June. Director, Mr. Husted K. Watson, Room 1009, State Capitol Bldg., Lincoln 9.

NEW HAMPSHIRE: *Examination and Endorsement.* Concord, Mar. 11-14. Sec., Dr. Edw. W. Colby, 61 So. State St., Concord.

NEW MEXICO:* *Examination and Reciprocity.* Sante Fe, May 18-19. Sec., Dr. R. C. Derbyshire, 227 East Palace Ave., Santa Fe.

NORTH CAROLINA: *Examination.* June Asst. Sec., Mrs. Louise J. McNeill, 716 Professional Bldg., Raleigh.

OKLAHOMA:* *Examination.* Oklahoma City, June 2-3. Exec. Sec., Mrs. E. L. Haidek, 813 Braniff Bldg., Oklahoma City.

PUERTO RICO: *Examination and Reciprocity.* San Juan, March 3. Acting Secretary, Dr. Herminio Mendez Herrera, Box 9156, Santurce.

TEXAS:* *Examination and Reciprocity.* Fort Worth, June 22-24. Sec., Dr. M. H. Crabb, 1714 Medical Arts Bldg., Fort Worth 2.

UTAH: *Examination.* Salt Lake City, July 8-10. Dir., Mr. Frank E. Lees, 324 State Capitol Bldg., Salt Lake City 1.

VERMONT: *Examination and Reciprocity.* Burlington, Jan. 29-31. Sec., Dr. F. J. Lawliss, Richford.

WYOMING: *Examination and Reciprocity.* Cheyenne, Feb. 2. Sec., Dr. Franklin D. Yoder, State Office Bldg., Cheyenne.

BOARDS OF EXAMINERS IN THE BASIC SCIENCES

ARKANSAS: *Examination.* Little Rock, May 4-5. Sec., Dr. S. C. Dellinger, University of Arkansas, Fayetteville.

CONNECTICUT: *Examination.* New Haven, Feb. 14. Exec. Asst., Mrs. Regina G. Brown, 258 Bradley St., New Haven 10.

FLORIDA: *Examination.* Miami, June 6. Sec., Mr. M. W. Emmel, University of Florida, Box 340, Gainesville.

KANSAS: *Examination.* Kansas City, June. Sec., Dr. L. C. Heckert, Pittsburg.

MICHIGAN: *Examination.* Ann Arbor and Detroit, Feb. 12-13. Sec., Mrs. Anne Baker, 116 Stevens T. Mason Bldg., West Michigan Ave., Lansing.

OKLAHOMA: *Examination.* Oklahoma City, Mar. 27-28. Exec. Sec., Mrs. L. Haidek, 813 Braniff Bldg., Oklahoma City.

RHODE ISLAND: *Examination.* Providence, Feb. 18. Administrator of Professional Regulation, Mr. Thomas B. Casey, 366 State Office Bldg., Providence.

TEXAS: *Examination.* April 1959. Certificates issued by reciprocity and waiver on the first and fifteenth of each month. Sec., Bro. Raphael Wilson, 407 Perry-Brooks Bldg., Austin.

WISCONSIN: *Examination.* Madison, April 4. Final date for filing application is March 27. Milwaukee, June 6. Final date for final application is May 29. Sec., Mr. W. H. Barber, 621 Ransom St., Ripon.

*Basic Science Certificate required.

DEATHS

Arthur, William John, Merriam, Kan.; University of Kansas School of Medicine, Kansas City, Kan., 1953; interned at the Memorial Hospital in South Bend, Ind.; served a residency at the University of Kansas Medical Center in Kansas City, Kan., and the Veterans Administration Hospital in Kansas City, Mo.; died Nov. 16, aged 39.

Bassett, Henry Linn, Yardley, Pa.; Jefferson Medical College of Philadelphia, 1901; an associate member of the American Medical Association; in 1953 was cited by the Bucks County Medical Society for 50 years of service; for many years on the staff of the Mercer Hospital in Trenton, N. J., where he died Nov. 29, aged 84.

Berg, Nathaniel Ⓜ Long Island City, N. Y.; L. R. C. P., Edinburgh, L. R. C. S., Edinburgh, and L. R. F. P. & S., Glasgow, Scotland, 1937; veteran of World War II; died Nov. 26, aged 47.

Bernheim, Bertram Moses, Baltimore; born in Paducah, Ky., Feb. 15, 1880; Johns Hopkins University School of Medicine, Baltimore, 1905; associate professor emeritus of surgery at his alma mater; an associate member of the American Medical Association; member of the founders group of the American Board of Surgery; a founder of the American College of Surgeons; during World War I served overseas with Johns Hopkins Base Unit, captain and later major in the medical corps of the U. S. Army, American Expeditionary Force; received a citation for his work with combat troops during the fighting around Chateau Thierry in the summer of 1918; served on the staffs of the Johns Hopkins, Union Memorial, and West Baltimore General hospitals, the Hospital for Women of Maryland, and the Church Home and Infirmary; the Norton Medical Award for 1947 was given to him for his book "A Surgeon's Domain"; the award was made for the best book by a professional man written for the layman; author of "Surgery of the Vascular System," published in 1913, "Blood Transfusion, Hemorrhage and the Anemias," 1917, "Passed as Censored," 1918, "Medicine at the Crossroads," 1939, "Adventure in Blood Transfusion," 1942, and "The Story of the Johns Hopkins," 1948; died in the Union Memorial Hospital Nov. 28, aged 78.

Bilek, George James Ⓜ Chicago; Indiana University School of Medicine, Indianapolis, 1929; on the staff of the Evangelical Hospital; served during World War II; died Nov. 28, aged 55.

Ⓜ Indicates Member of the American Medical Association.

Bisson, Napoleon Ⓜ Waterville, Maine; Baltimore Medical College, 1907; fellow of the American College of Surgeons; veteran of World War I; during World War II medical examiner for Kennebec County and the examining physician for Waterville area Selective Service draft board; member of the staffs of Sisters' and Thayer hospitals; a director of the Federal Trust Company; Knight of St. Gregory of the Roman Catholic Church; died Nov. 5, aged 76.

Boettcher, Heinz Hans Otto, Terrell, Texas; Universitat Leipzig Medizinische Fakultat, Saxony, Germany, 1937; resident on the staff of the Terrell State Hospital; died near Ludlow, Okla., Nov. 8, aged 45.

Bondoc, Jose Ma, Richmond, Ind.; University of Santo Tomas Faculty of Medicine and Surgery, Manila, P. I., 1943; interned at the Quincy City (Mass.) Hospital; resident surgeon at the Richmond State Hospital; died in the Reid Memorial Hospital Nov. 3, aged 40.

Budlong, Lewis Stanley, Watertown, N. Y.; University and Bellevue Hospital Medical College, New York City, 1899; an associate member of the American Medical Association; on the staffs of the House of the Good Samaritan and Mercy hospital; died in the Jefferson County Sanatorium and Hospital for Chronic Diseases Nov. 2, aged 80.

Bush, David Hardman, Mount Sterling, Ky.; University of Louisville (Ky.) Medical Department, 1898; an associate member of the American Medical Association; served as state senator; on the staff of Mary Chiles Hospital; died Nov. 7, aged 86.

Butzin, Theodore Arzt, Beverly Hills, Calif.; University of Minnesota Medical School, Minneapolis, 1928; died Nov. 14, aged 63.

Carter, John William, Syracuse, N. Y.; Syracuse University College of Medicine, 1927; interned at the Crouse–Irving Hospital in Syracuse, and St. Michael's Hospital in Newark, N. J.; veteran of World War I; alderman in the Sixth Ward for two terms; on the staffs of St. Joseph's and Onondaga General hospitals; a physician for the New York State Athletic Commission many years; died Nov. 11, aged 59.

Chatfield, Paul Oakes, Philadelphia; Johns Hopkins University School of Medicine, Baltimore, 1943; interned at Johns Hopkins Hospital in Baltimore; assistant professor of neurology at Jefferson Medical

College; formerly on the faculty of Harvard Medical School in Boston; served as a battalion surgeon in the 96th quartermaster battalion in Europe during World War II; from 1953 to 1956 chief of the section of clinical neurophysiology at the National Institute of Neurological Diseases and Blindness in Bethesda, Md.; on the staff of Jefferson Hospital; died in St. Luke's and Children's Medical Center Nov. 18, aged 41.

Colef, Irving Edwin, Corpus Christi, Texas; Detroit College of Medicine and Surgery, 1930; member of the Industrial Medical Association; interned at the Butterworth Hospital in Grand Rapids, Mich.; formerly practiced in Benton Harbor, Mich., where he was associated with the Mercy Hospital; died Nov. 4, aged 55.

Cumbler, George William Ⓜ New York City; University and Bellevue Hospital Medical College, New York City, 1920; specialist certified by the American Board of Internal Medicine; member of the American Rheumatism Association; fellow of the American College of Physicians; served as visiting physician, New York City Correction Hospitals, attending physician, Grasslands Hospital in Valhalla, N. Y., and St. Agnes Hospital in White Plains, N. Y., where he was chief of the arthritis clinic; chief of arthritis clinic, White Plains, (N. Y.) Hospital; died Nov. 14, aged 65.

Cusick, Laurence Francis Ⓜ Nahant, Mass.; Harvard Medical School, Boston, 1904; medical examiner in the Lynn district for 21 years; on the staffs of the Union Hospital and the Lynn Hospital, in Lynn, where he died Nov. 3, aged 79.

Davey, Byron Theodore, New York City; University of Toronto Faculty of Medicine, Toronto, Ontario, Canada, 1905; an associate member of the American Medical Association; on the staff of the Midtown Hospital, where he died Nov. 6, aged 82.

Der Brucke, Maurice G., Brooklyn; Long Island College Hospital, Brooklyn, 1920; specialist certified by the American Board of Obstetrics and Gynecology; fellow of the International College of Surgeons and the American College of Surgeons; associated with the Brooklyn Doctors Hospital, Coney Island Hospital, and the Caledonian Hospital, where he died Nov. 15, aged 60.

Dewis, Edwin Grafing Ⓜ Asbury Park, N. J.; born in New York City in 1892; New York Homeopathic Medical College and Flower Hospital, New York City, 1918; member of the Industrial Medical Association and the American Public Health Association; veteran of World War I; served as president and secretary of the Association of Life Insurance Medical Directors, as secretary and treasurer of the Society for the Prevention of Asphyxiation Deaths, and vice-president of the International Congress on Life Assurance Medicine and a member of its permanent international committee; for many years chief medical director of the Prudential Insurance Company of America, which he joined in 1920; died Nov. 9, aged 66.

Eaton, Lealdes McKendree Ⓜ Rochester, Minn.; born in Owaneco, Ill., Feb. 3, 1905; Rush Medical College, Chicago, 1932; interned at the Cook County Hospital in Chicago; in 1933 became a fellow in neurology in the Mayo Foundation and in 1936 a consultant in neurology on the staff of the Mayo Clinic, where he was chairman of the sections of neurology and professor of neurology; specialist certified by the American Board of Psychiatry and Neurology, of which he was a director and examiner; president of the Association for Research in Nervous and Mental Diseases; in 1953 president and formerly secretary of the Central Neuropsychiatric Association; member of the American Neurological Association, the Alpha Omega Alpha honorary medical society, and the Nu Sigma Nu; fellow of the American Academy of Neurology; in 1956 chairman of the Section on Nervous and Mental Diseases of the American Medical Association; member of the advisory board of the Myasthenia Gravis Foundation; author and coauthor of more than 50 papers on various neurologic problems; editor of the book, "Clinical Examinations in Neurology," written by members of the sections of neurology and published in 1956; died in the Methodist–Worrall Hospital Nov. 18, aged 53.

Emerson, George Short Ⓜ Fitzwilliam, N. H.; Baltimore Medical College, 1897; served many years on the school board and the Fitzwilliam new school was named for him; a member of the board of health for many years; a member of the staff of the Elliot Community Hospital in Keene; died Nov. 7, aged 87.

Epstein, Harry Benjamin, Newark, N. J.; born in Elizabeth, June 20, 1872; New York University Medical College, New York City, 1896; also a graduate in pharmacy; an associate member of the American Medical Association; fellow of the American College of Surgeons; past-president of the Anatomical and Pathological Society of Northern New Jersey and the Academy of Medicine of Northern New Jersey, of which he was a trustee; an honorary member of the Society of Surgeons of New Jersey; veteran of World War I; associated with the Presbyterian, Newark City, and Newark Beth Israel hospitals; served as medical director of the Jewish Children's Home; author of "William Shakespeare, M.D."; died at his home in East Orange Nov. 22, aged 86.

Herron, Stanford Morton, Jackson, Tenn.; University of Tennessee College of Medicine, Memphis, 1919; member of the Tennessee State Medical As-

sociation; secretary of the Madison County Tuberculosis Association and the Consolidated Medical Assembly of West Tennessee; past-president and secretary of the Tennessee Tuberculosis Association and for many years a member of the board; twice served as president of Jackson Rotary and was past Rotary District governor; on the staffs of the Jackson–Madison County General Hospital and the Webb–Williamson Hospital, where he died Oct. 22, aged 67.

Scott, Edgar Leonard, Chattanooga, Tenn.; Meharry Medical College, Nashville, 1932; on the staff of the Carver Memorial Hospital, where he died Oct. 21, aged 52.

Johnston, Frank, Milton, Ill.; Missouri Medical College, St. Louis, 1897; member of the staff of Illini Hospital in Pittsfield; died in Winston–Salem, N. C., Oct. 23, aged 85.

Julius, Abraham J., New York City; Long Island College Hospital, Brooklyn, 1922; died in the Veterans Administration Hospital Oct. 14, aged 59.

Kearney, Elmer Frank Ⓜ Oregon, Mo.; Barnes Medical College, St. Louis, 1906; past-president of the school board; veteran of World War I; served as probate judge and then magistrate judge in Holt County since 1939; died in the Veterans Administration Center, Wadsworth, Kan., Oct. 22, aged 78.

King, Wessie Price, Weston, W. Va.; University of Maryland School of Medicine, Baltimore, 1891; an associate member of the American Medical Association; for many years physician and surgeon for the Baltimore and Ohio Railroad; on the staff of the Weston City Hospital; died Nov. 8, aged 88.

Koch, George William Ⓜ Anaheim, Calif.; Rush Medical College, Chicago, 1904; for many years practiced in Sioux City, Ia.; served on the staff of St. Joseph Hospital in Orange; died in the Anaheim Memorial Hospital Oct. 22, aged 79.

Kotanchik, Walter Edward Ⓜ Shamokin, Pa.; Jefferson Medical College of Philadelphia, 1933; interned at the Williamsport (Pa.) Hospital; served a residency at the Brooklyn Eye and Ear Hospital; veteran of World War II; died in the Geisinger Memorial Hospital, Danville, Oct. 23, aged 55.

Lamb, William Paul, East Orange, N. J.; University and Bellevue Hospital Medical College, New York City, 1904; for many years assistant medical director of the Prudential Insurance Company; died Nov. 6, aged 78.

Lawton, William Henry Ⓜ Colonel, U. S. Air Force, retired, Fort Pierce, Fla.; born in Garnett, S. C., Nov. 19, 1897; George Washington University School of Medicine, Washington, D. C., 1927; service member of the American Medical Association; member of the Aero Medical Association; specialist certified by the American Board of Preventive Medicine; served in the U. S. Army from 1928 to 1949, when he transferred to the U. S. Air Force; was awarded the Legion of Merit; in November, 1958, was awarded the McLester Award by the Association of Military Surgeons of the United States for work in nutrition; died in the USAF Hospital, Palm Beach Air Force Base, Nov. 6, aged 60.

Longbrake, Pearl Duette Ⓜ Marysville, Ohio; Ohio Medical University, Columbus, 1897; died in the Memorial Hospital Oct. 24, aged 83.

McCarthy, John Anthony Ⓜ Braintree, Mass.; Tufts College Medical School, Boston, 1930; service member of the American Medical Association; member of the American College of Chest Physicians; veteran of World War I; formerly associated with the Veterans Administration in Boston; died in the Quincy City (Mass.) Hospital Oct. 28, aged 61.

McDougal, Clyde Cameron, Westport, Conn.; University of Buffalo School of Medicine, 1932; served on the faculty of New York Medical College, Flower and Fifth Avenue Hospitals in New York City, where he formerly practiced and where he was associated with Morrisania and Columbus hospitals; died in the Veterans Administration Hospital, New York City, Oct. 9, aged 63.

Marcus, Isaac Horatio, Brooklyn; University and Bellevue Hospital Medical College, New York City, 1908; served on the staff of the Unity Hospital; died in the Long Island College Hospital Oct. 11, aged 73.

Martin, Aaron Wise Ⓜ Hillsville, Va.; George Washington University School of Medicine, Washington, D. C., 1912; died Aug. 30, aged 79.

Mendel, Max Louis, Vicksburg, Miss.; Rush Medical College, Chicago, 1907; veteran of World War I; for many years practiced in Chicago, where he was on the staffs of the Englewood and Illinois Central hospitals and head of the medical department of the Chesapeake and Ohio Railroad; charter member of the University of Chicago Phi Gamma Delta fraternity and was a member of Nu Sigma Nu medical fraternity; member of the Illinois State Medical Society; died Oct. 18, aged 76.

Meyer, Selma E., Kew Gardens, N. Y.; Friedrich–Wilhelms–Universität Medizinische Fakultät, Berlin, Prussia, 1917; died Oct. 14, aged 77.

Michael, Guy H., Parsons, W. Va.; born Jan. 1, 1896; St. Louis College of Physicians and Surgeons, 1922; past-president and secretary of the Barbour–Randolph–Tucker Counties Medical Society; an associate member of the American Medical Association; honorary life member, served as a member

of the council, and past-vice-president of the West Virginia State Medical Association; veteran of World War I; served as mayor of Belington; for six years a member of the Tucker County Board of Education; formerly county health officer; a charter member of the Parsons Lions Club; superintendent of the Tucker County Hospital; died Nov. 2, aged 62.

Mock, Lewis Emmett, Mountain City, Tenn.; University of Tennessee Medical Department, Nashville, 1906; died Sept. 10, aged 83.

Moore, Darius Carrier, Beaver, Pa.; Jefferson Medical College, Philadelphia, 1903; an associate member of the American Medical Association; served as a member and president of the board of directors of Monaca (Pa.) First National Bank; died Oct. 29, aged 79.

Moore, Wallace P. Ⓜ Memphis, Tenn.; Memphis Hospital Medical College, 1902; served as city and county health officer, and county jail physician; died Nov. 2, aged 77.

Myers, Lotta Wright, New York City; Woman's Medical College of the New York Infirmary for Women and Children, New York City, 1897; an associate member of the American Medical Association; died in the Roosevelt Hospital Oct. 5, aged 90.

Perkins, Edward Carter Ⓜ Hartford, Conn.; Columbia University College of Physicians and Surgeons, New York City, 1910; for many years a medical missionary in China; died in the Mitchell Convalescent Hospital, West Hartford, Oct. 30, aged 82.

Perry, Robert Jackson Ⓜ Springville, Tenn.; University of the South Medical Department, Sewanee, 1905; died Nov. 1, aged 90.

Raphael, Joseph, Brooklyn; Long Island College Hospital, Brooklyn, 1904; formerly on the faculty of his alma mater; an associate member of the American Medical Association; fellow of the American College of Surgeons; served as secretary of the Medical Society of the County of Kings as well as member of the board of trustees and former chairman of the Workmen's Compensation Commission; veteran of World War I; consulting surgeon at Kings County, Caledonian, and Jewish hospitals; died in the Brooklyn Hospital Oct. 11, aged 80.

Richards, John Harold Ⓜ New York City; Cornell University Medical College, New York City, 1905; formerly on the faculty of his alma mater and the New York Polyclinic Medical School and Hospital; served on the staffs of Bellevue and New York hospitals; died in the Westchester division of the New York Hospital in White Plains Oct. 27, aged 78.

Sawyer, Earle Dewey Ⓜ Wenatchee, Wash.; Tufts College Medical School, Boston, 1907; died Oct. 24, aged 74.

Schmidhofer, Max Ⓜ Chicago; Jenner Medical College, Chicago, 1913; medical examiner at 5th Army headquarters; died in the Illinois Masonic Hospital Nov. 11, aged 74.

Schmitt, Alton Joseph Ⓜ Sheboygan, Wis.; University of Wisconsin Medical School, Madison, 1931; served an internship at the Long Island College Hospital in Brooklyn, where he served a residency; died in Chicago Nov. 7, aged 54.

Schultz, J. Albert Ⓜ Albert Lea, Minn.; Rush Medical College, Chicago, 1902; died in the Naeve Hospital Oct. 31, aged 81.

Scott, Ernest Winfield, Ormond Beach, Fla.; University of Virginia Department of Medicine, Charlottesville, 1907; formerly associated with the U. S. Public Health Service; served as assistant medical director of the Equitable Life Insurance Company; died Sept. 30, aged 73.

Smith, Morris, New York City; Long Island College Hospital, Brooklyn, 1913; an associate member of the American Medical Association; died Sept. 28, aged 75.

Stutsman, Carl, Burlington, Iowa; Northwestern University Medical School, Chicago, 1893; served as city health officer; on the staffs of the Burlington and Mercy hospitals; died Oct. 27, aged 90.

Thom, James Alexander, Baton Rouge, La.; Medical Department of Tulane University of Louisiana, New Orleans, 1912; member of the Louisiana State Medical Society; on the staff of the Baton Rouge General Hospital, where he died Oct. 30, aged 76.

Younkin, J. Noble, Chesterfield, Ind.; American Medical College, St. Louis, 1901; veteran of World War I; died Oct. 26, aged 83.

Viktoryn, John Wenceslaus, Cleveland; Western Reserve University School of Medicine, Cleveland, 1932; veteran of World War II; on the staff of St. Alexis Hospital, where he served an internship and residency; died Oct. 22, aged 53.

Weber, Henry Charles Ⓜ Captain, U. S. Navy, retired, Drexel Hill, Pa.; Marquette University School of Medicine, Milwaukee, 1914; entered the U. S. Navy June 29, 1921; retired March 1, 1947; specialist certified by the American Board of Ophthalmology and the American Board of Otolaryngology; member of the American Academy of Ophthalmology and Otolaryngology; fellow of the American College of Surgeons; served on the staff of the Halifax District Hospital in Daytona Beach, Fla.; died in the U. S. Naval Hospital, Bethesda, Md., Oct. 30, aged 71.

FOREIGN LETTERS

BRAZIL

Biopsy of the Endometrium.—Dr. N. M. Fonseca (*Anais brasileiros de ginecologia*, vol. 46, 1958) studied endometrial biopsy specimens of 500 curettements to ascertain whether the results of the biopsy could be used as a test of ovarian function. This use is based on the demonstration by Hitschmann and Adler of the cyclic modifications of the endometrium and on the evidence accumulated by Schroeder of the correlation between the ovarian and the endometrial cycles. This study permitted a tentative classification of the alterations under the following headings: (1) simple diffuse hyperplasia, 200 cases; (2) cystic diffuse hyperplasia, 80; (3) hyperplasia of the glands, 63; (4) hyperplasia of the stroma, 5; (5) circumscribed hyperplasia, 15; (6) mixed endometrium, 53; (7) hyperplastic mixed endometrium, 33; and (8) posthyperplastic secretory endometrium, 23. The late proliferative, the persistent secretory, and the atrophic types of endometrium were not included in this series. These types of endometrium can only be diagnosed on the basis of clinical data not always available to the pathologist.

The author concluded that biopsy of the endometrium should be performed, as far as possible, at the end of the menstrual cycle. The existence of a secretory endometrium at the end of the cycle, in a eumenorrheic patient, signifies, in nearly all cases, that there was ovulation and that the ovary functioned normally during the cycle. The existence of a physiopathological endometrium strongly suggests a functional disturbance of the ovary. The single biopsy of the endometrium, as with other functional tests of the ovary, is not sufficient for the determination of ovarian function. In order to assess the functional state of the ovary, it is necessary to take an endometrial biopsy specimen together with other functional tests of the ovary. The accuracy of the functional evaluation will increase with the number of tests used. The cases with hyperplasia represented 62.5% of the total, if the persistent secretory, the late proliferative, and the atrophic types of endometrium were excluded.

Cardiovascular Syphilis.—Dr. M. de Brito Avila and co-workers presented to the Associação Paulista de Medicina a report of 196 patients with cardiovascular syphilis found among 9,200 syphilitic patients discovered through a serological survey of 331,939 industrial workers of São Paulo. The cardiovascular localization was found most frequently among patients between 36 and 55 years of age (132 patients, or 67.3%). Among the 196 patients, 0.7% had an uncomplicated aortitis and 1.4% a complicated aortitis. Uncomplicated aortitis was more frequent than aortic insufficiency and aortic aneurysm among patients in the age group 36 to 55 years (38.5%, 23.3%, and 20.0% respectively). The frequency of uncomplicated aortitis diminished with the age while that of aortic insufficiency and aortic aneurysm increased among patients 56 or over (10.7%, 27.2%, and 33.3% respectively).

Cardiovascular syphilis was more frequent among men than among women (2.5:1), and uncomplicated aortitis and aortic aneurysm were more frequent among women (40.9% and 18.1% respectively) than among men (32.1% and 11.4%). Aortic insufficiency was more frequent among men than among women (56.8% and 40.9%). No significant difference was found in uncomplicated aortitis in white and colored patients (32.8% and 34.0%). The frequency of cardiovascular syphilis in younger age groups was higher in colored than in white patients. Most patients had their cardiovascular syphilis diagnosed from 11 to 30 years after the initial lesion. Uncomplicated aortitis was found with highest frequency in the second decade of the infection, while the highest frequency of aortic insufficiency and aortic aneurysm was found in the third decade. Of the 196 patients with cardiovascular syphilis, 23% also had involvement of the central nervous system. Of these patients 24% showed symptoms interfering with their professional activity.

ITALY

Liver Regeneration After Hepatectomy.—A. Dagradi and co-workers (*Chirurgia e patologia sperimentale*, vol. 6, 1958) used rats in a study of hepatic regenerative phenomena because these animals survive the removal of 67% of the liver. Hepatic regeneration in rats takes place for one week after subtotal resection. A premitotic period of regeneration lasts 24 hours; a mitotic period lasts till the end of the third day; and a postmitotic period lasts until the end of the quantitative recovery of the liver. The postmitotic period may be further subdivided into a slow revival during the second week of the regenerative process which is related to the recovery of the body-weight of the animal, which falls in the first week because of undernutrition

The items in these letters are contributed by regular correspondents in the various foreign countries.

caused by the operation and not by a specific regenerative stimulus. The fundamental process of liver regeneration lies in nucleic acid synthesis and cellular division. Its cause may be a decrease of the substance produced by the hepatic cells which normally inhibits proliferation.

Heparin Hypersensitivity.—P. Ottaviani and co-workers *(Progresso medico,* Sept. 15, 1958), having studied the heparin hypersensitivity syndrome, pointed out that it is characterized by localized allergic manifestations, pulmonary edema, and cardiovascular failure which may result in shock. Using various heparin preparations in guinea pigs the authors found that the antigenic property of heparin is due to the drug itself and cannot be referred to other substances contained in various heparin preparations. In patients in whom heparin therapy is necessary, the treatment can be started again after specific desensitization.

Renal Function After Nephrectomy.—P. Zucchelli and co-workers *(Riforma medica,* vol. 43, Oct. 25, 1958) studied renal function after the removal of one kidney in 19 patients. Glomerular filtration exceeded 100 cc. per minute only in patients who had been operated on at least six months earlier. The compensatory adaption of the flow of plasma paralleled the return of glomerular filtration.

NORWAY

Treatment by Manipulation.—A series of discussions reported in *Nordisk medicin* for Sept. 25 showed how much is being done by orthopedists and other physicians to rescue manipulative treatment from the various healing cults, to study its basic principles, and to exploit what is best in it under scientific safeguards. The discussions were prompted by a study by Dr. E. H. Schiötz that ran serially in *Tidsskrift for den norske lægeforenning.* In January, 1957, the national health insurance authorities decided to defray some of the charges of the practitioners of manipulative treatment. They must, however, have been duly recognized as such by a board of examiners, and the physician recommending manipulative treatment to the patient must be a specialist in orthopedics, neurology, or rheumatology. To be recognized as such, the manipulative practitioner must have had at least three years' training in this field, and he must have satisfied a board of examiners on which the medical profession was substantially represented.

Stature of Norwegians.—Professor A. Sundal (*Nasjonalforeningen mot tuberkulosen for folkehelsen,* vol. 48, 1958) presented figures showing that improvement of environment has not only reduced infant mortality but has also added to individual weight and stature. In 1900 there were 81 deaths during the first year of life per 1,000 live births, whereas the corresponding figure for 1954 was 21.4. In 1956 17,000 children between the ages of 0 and 15 in Bergen were compared with 25,000 children in Oslo who were the same age in 1931. In the matter of height and weight the 10-year-old boys and girls in Bergen were equal to the 11½-year-old boys and girls of Oslo. This upward shift of stature was also demonstrable in military draftees, for between 1910 and 1949 the mean height of recruits increased from 171 to 175.6 cm. (5 ft. 7 in. to 5 ft. 9 in.). Much of the credit for this change belongs to the child welfare stations in operation during the last 40 years.

Trichinosis.—Dr. T. Flatmark (*Tidsskrift for den norske lægeforening,* Sept. 1, 1958) stated that the German invasion of Norway in 1940 led to outbreaks of trichinosis in this country and to sanitary measures which are still in force. In the autumn of 1940, 668 German soldiers and 10 Norwegian civilians fell ill, but there was only one death (a German) and 67% of all the cases were moderately severe or mild. Strict preventive measures are now enforced. In 1943 serologic tests for trichinosis in 15 German soldiers who had eaten a polar bear proved positive, giving support to the opinion that 60% of such bears were thus infected. While trichinosis in man has become rare in Norway, the demonstration of this disease in swine is impressive, with as many as 66 such cases in one county between 1940 and 1954. The total for the country as a whole was 332 cases in swine publicly or privately slaughtered in the same period. Flatmark suggested that trichinosis in Norwegians may be less rare than is suspected, since it is likely to run a mild course and thus escape detection.

Norwegian Medical Society.—Just 125 years ago an epidemic of cholera stirred 16 men, including 2 apothecaries, to meet it by banding themselves together into a body designed to combat it. The membership of this medical society was not numerically impressive, but when it celebrated its 50th birthday it could boast a membership of 192. Now it has soared to about 500. At first the modest ambition of this body was to act as a discussion club and to air the opinions of its members on current medical problems, and its earlier records reveal a certain, and doubtless inevitable, ambiguity of outlook and paucity of scientific data. At present the Norwegian Medical Society has become the forum before which scientific data are carefully scrutinized. In the presence of King Olav, the chairman of the Society, Professor H. A. Salvesen, outlined the achievements made by medical science in the past 25 years. In no other 25-year period in the history of man has such progress been made as in the last quarter of a century.

Interval Operation for Cholecystitis.—Hertzberg and Nilssen (*Journal of the Oslo City Hospitals,* vol. 8, September, 1958) discussed the comparative merits of immediate operation for acute cholecystitis and conservative treatment followed by operation later. Their material consisted of 406 unselected patients treated in the 11-year period 1945-1955 at Ullevaal hospital with a mortality of 7.4% (30 deaths). There were no deaths among the 77 patients under the age of 50. The most frequent but least serious complication was pancreatitis, observed in 131 patients; rupture of the gallbladder with peritonitis occurred in 20; and stones of the common bile duct with persistent cholangitis and jaundice in 23. Interval cholecystectomy was performed on 123 patients with an average age of 55 with no deaths. There were 169 patients with an average age of 57 who refused the recommended operation. Questionnaires subsequently addressed to them yielded data about 106 of them. Among them were 2 who had died of their disease, 9 who had been operated on elsewhere, 58 who still had symptoms, and 37 who had become symptom-free. It was concluded that immediate operation might be preferable after the ages of 60 or 70. A disadvantage of interval operation was that many patients who were advised to have it did not do so. Penicillin alone or with streptomycin and broad-spectrum antibiotics seemed to be about equally effective in reducing mortality. Vital indications may warrant immediate operation in the acute stage of the disease.

SWEDEN

Histamine Determination.—Dunér and Pernow (*Scandinavian Journal of Clinical and Laboratory Investigation,* vol. 10, 1958) reported a modified technique for determination of histamine in the blood, based on their earlier method for extracting histamine from the urine. The content of histamine in serum ranged from 0.6 to 2.8 mcg. per 100 ml. of blood (mean 1.29). The corresponding values for blood cells were 1.0 to 4.6 (mean 2.66). The specificity of the method was studied by passing mixtures of histamine and other smooth-muscle-stimulating agents such as acetylcholine, 5-hydroxytryptamine (5 HT), substance P, and potassium through the Amberlite IRC-50 column. At the subsequent biological assay of the eluates, 5 HT and potassium were found in the same fractions as the histamine. Because of this finding the earlier method for extraction and determination of histamine was modified by a treatment of the eluates with alcohol acetone in order to precipitate the salts, and by addition of dihydroergotamine to the bath-fluid in order to make the intestine insensitive to 5 HT. Administration of antihistaminic promethazine renders the biological assay of histamine impossible because of excretion of promethazine in the urine, but the promethazine can be eliminated by extraction with ether. The excretion of histamine in the urine was found not to be influenced by oral administration of promethazine.

Enzyme Patterns in Serum and Tissue Extracts.—The proportions of serum glutamic-oxalacetic transaminase (SGO-T), serum glutamic-pyruvic transaminase (SGP-T), and serum lactic dehydrogenase (SLD) in patients with acute myocardial infarction were found by S. Linde (*Scandinavian Journal of Clinical and Laboratory Investigation,* vol. 10, 1958) to be about the same as those of these enzymes in muscle extracts. Linde reported on the maximal increase in the serum enzyme activities in 32 patients with myocardial infarction and compared it with the enzyme activities in striated muscles from 10 healthy human beings and noted that the proportions corresponded fairly well. The relative proportions between the serum enzyme activities in 22 patients with epidemic hepatitis did not correspond to the enzyme activities in hepatic tissues from 10 healthy human beings, where the SCP-T activity is much less than the SGO-T activity. In eight rabbits in which hepatic damage was produced with carbon tetrachloride and in human beings with hepatic injury due to acute alcoholic intoxication the proportions between the different serum enzymes were about the same as in hepatic tissue.

The Blood-Brain Phenomenon.—Ricardo Edström in *Acta psychiatrica et neurologica scandinavica* (vol. 33, 1958) stated that since there seems to be a virtual lack of extravascular, extracellular space within the brain, it had been suggested that the well-known restriction to transport from the blood may not need the assumption of a specific blood-brain barrier. The restriction may merely be a combined effect of the obstacles offered by a normal capillary wall and the closely adjacent cell membranes. The transfer thus takes place from the blood directed into the intracellular space and not to an extracellular, extravascular space, as is the case in other organs.

Pneumoencephalographic Studies in Epileptics.—The occurrence of pneumoencephalographic signs of atrophy was investigated by B. Falk and coworkers (*Acta psychiatrica et neurologica scandinavica,* vol. 33, 1958) in two groups of ambulant epileptics. The disease had been of long duration in most patients, and the frequency of fits had been moderate to low. In 20 patients with central epilepsy 5 showed slightly widened lateral ventricles. No definite dilatation of sulci was found. In 25 patients with temporal lobe epilepsy 4 showed a slight dilatation of the lateral ventricles, and the gyri in various parts of the cortex were more or less dilated in 11. The temporal horns showed a

slight dilatation in 4. The frequency of grand mal seizures did not in the cases reported seem to have any relation to the occurrence of atrophy as evidenced by pneumoencephalography.

Asymptomatic Myocarditis.—In order to determine the possible presence of asymptomatic myocarditis after Asian influenza, Levander and Rigner (*Militär Hälsovård,* vol. 2, 1958) examined 85 conscripts who were apparently in excellent health by electrocardiography in the recumbent and the erect position two to six weeks after the onset of Asian influenza; 75 who had not been ill were used as controls. Three of the patients showed changes in the S-T segment and T-waves strongly suggesting myocarditis or perimyocarditis while the controls did not show these changes. No other subjective or objective cardiac symptoms were observed in these three patients. Radiography of the heart did not reveal any abnormality and physical working capacity was normal. In one patient the electrocardiographic changes disappeared within two weeks. A relationship between myocarditis and influenza in this patient was suggested. In the other two patients the electrocardiographic changes persisted but showed a tendency to regress during an observation period of 11 weeks, their relation to the preexisting influenza being therefore doubtful.

A relatively high frequency coronary sinus rhythm was observed in one of the patients, and in the control group one of the men showed a low frequency ventricular pacemaker of the passive type. The ECGs taken in the erect position revealed pathological changes which were more marked than those shown in the ECGs taken in the recumbent position. ECGs taken in the erect position were recommended as a valuable and simple supplementary method of examination. These findings support the view expressed by earlier workers that asymptomatic myocarditis is not uncommon and should be kept in mind.

Acute Intermittent Porphyria.—Nettelbladt and Nisell (*Opuscula Medica,* vol. 3, 1958) reported a series of 24 patients with porphyrinuria, 13 of whom had acute intermittent porphyria. All of them suffered from abdominal pain and in all but one dark urine was passed. Most of the attacks were benign with spontaneous recovery, but in two the course was protracted. Precipitating factors in some of the attacks were ingestion of barbiturate, infection, and pregnancy. In the same issue Gösta von Reis reported that among these 13 patients 7 had psychic changes, 4 showing hysterical symptoms and 2 oligophrenia. Neurological symptoms were found in seven patients, four showing signs of peripheral neuron lesions and two severe motor disturbances including tetraplegia and diaphragmatic paralysis. Landry's ascending paralysis was not observed, but three patients had epileptic seizures.

Chemotherapy in Cancer.—S. Kallner (*Opuscula Medica,* vol. 3, 1958) stated that conventional methods of treating cancer show a low cure rate, but busulfan has given good results in patients with granulocytic leukemia. The results of treatment of cancer with ethyleneimine quinone have varied markedly, but in some patients the primary tumors and metastases decreased or disappeared. Striking effects were particularly noted in some patients with pulmonary carcinoma.

Staphylococcic Infections in a Hospital.—An epidemic of staphylococcic infection occurring on the neurosurgical ward of Södersjukhuset Hospital in Stockholm was described by Ragnar Frykholm (*Opuscula Medica,* vol. 3, 1958). Of five who had had brain surgery, only one survived. A separation into clean and infected wards was recommended. Patients treated with antibiotics were regarded as potential carriers of infection. Prophylactic antibiotic therapy was no longer used. In a general surgical ward Forsgren and Varenius (same issue) found that about 50% of the ward personnel were nose and throat carriers of Staphylococcus pyogenes var. aureus. Of these carriers 31% had staphylococci with antibiograms and phage patterns that were identical with those of six patients who developed staphylococcic infections in the hospital. In the floor dust and room air around the patients identical staphylococci were found. A reduction in the use of antibiotic therapy and general hygienic measures formerly routine was adopted and two months later no new infection had occurred among the patients and the original pathogenic phage types could no longer be found among the personnel or on the premises.

Treatment of Tuberculosis.—Dahlström and Uggla (*Opuscula Medica,* vol. 3, 1958) stated that the negative attitude towards the use of ACTH and cortisone in tuberculosis was based on results of animal experiments. The authors made a controlled investigation on 15 patients who were treated with cortisone and specific chemotherapeutic agents. They obtained good results and they emphasized that an absolute prerequisite for using cortisone in the treatment of tuberculosis was simultaneous and efficient chemotherapy.

Staphylococcic Septicemia.—Georg Matell (*Opuscula Medica,* vol. 3, 1958) successfully treated two patients who had staphylococcic septicemia with liberal use of antibiotics, causing metastatic pneumonia. He believed the development of resistant strains of staphylococci had changed the clinical findings in severe staphylococcic infections, and these had supplanted pneumococcic infections as the terminal illness in elderly patients. Staphylococcic septicemia in its classical form has become rare.

The prognosis of the classical form was probably much better than was generally believed. The two patients reported, a 30-year-old woman and a 46-year-old man, both with severe sepsis after incision of carbuncles and with pulmonary involvement, were cured, one with terramycin and oxytetracycline and the other with oxytetracycline and erythromycin in combination with oleandomycin tetracycline.

UNITED KINGDOM

Salicylates and Gastrointestinal Hemorrhage.—In a series of 103 patients with hematemesis and/or melena, 55 had taken salicylates within the preceding 72 hours, compared with only 17 of 103 patients complaining of dyspepsia but not of gastrointestinal bleeding, according to Alvarez and Summerskill (*Lancet* **2**:920, 1958). There was an even more striking difference between the two groups as regards the taking of salicylates in the 24 hours preceding hemorrhage or the onset of dyspeptic symptoms: 49 of those with bleeding, and only 7 of those complaining of dyspepsia. Occult blood loss in the stools occurred during periods of taking salicylates in about 50% of patients with peptic ulcer or x-ray negative dyspepsia and in a comparable percentage of controls. Both soluble and insoluble aspirin caused occult bleeding, but nonsalicylate analgesics (e. g., phenacetin) did not influence the occult blood content of the feces.

A Hazard of Needling.—Gibson and Norris (*Lancet* **2**:983, 1958) reported that when a hollow needle is thrust through the skin, it cores out a fragment of tissue in 69% of cases. The size of the needle has little to do with it, except that the core of skin is roughly proportional to the size of the needle's lumen. It is agreed, however, that if skin preparation is thorough, there is no reason to condemn the routine use of open-ended injection needles.

Prostatic Cancer.—The cytological examination of smears can be a valuable aid in the diagnosis of carcinoma of the prostate, according to Joseph Bamforth (*Ann. Roy. Coll. Surgeons England* **23**: 248, 1958). Of 513 specimens he received for examination from different sources, 177 proved to be inadequate as they did not contain sufficient prostatic epithelial cells for critical examination. Of the remaining 336 examined by cytology, 176 were reported as negative and 160 as positive or "suspicious." Of the latter 70 were confirmed by histological examination or by the development of metastases detected radiologically, and 90 were classified as undetermined. Most of these were regarded on clinical grounds as being definite cases of carcinoma. In some there were high values for serum acid phosphatase. Some might be cases of latent carcinoma.

Artificial Insemination.—The Eugenics Society has set up an A. I. D. council to consider the present status and genetic, medical, legal, and social potentialities of artificial insemination by a donor. What the council has in mind is the maintenance of a permanent committee which will at all times have a record of available data on such cases in this country, with all medical and scientific information relevant thereto. The following opinion has been expressed by the solicitor of the Medical Protection Society: "Although artificial insemination must by its very nature provide a source of legal complications affecting questions of legitimacy, inheritance, nullity, and divorce, it should not involve a doctor in any difficulty so long as he acts with care and discretion. The practitioner asked to carry out artificial insemination will be faced with no legal problem if the donor is to be the husband (A. I. H.). If the donor is to be someone other than the husband (A. I. D.), the position should be fully explained to the husband and the wife, and a request and consent in writing signed by both should be obtained."

Hospital Costs.—A new method of accounting was used in about 200 of the hospitals in the National Health Service (Hospital Costing Returns for Year Ended 31st March, Her Majesty's Stationery Office, 1958). Under the new system the costs are analyzed by departments, such as wards, works and maintenance, medical services, laundry, and administration. Hospital outpatient expenditure is now listed separately, whereas formerly it was estimated on the assumption that five outpatient attendances represented one inpatient day. The new estimates show that the average cost of an outpatient attendance in England and Wales is $2.40. In provincial teaching hospitals it is nearly $2.60, and in the London teaching hospitals it is $3.03. The average cost of a new outpatient in the three types of hospitals is $7.40, $7.50, and $12.60 respectively. The higher cost in London teaching hospitals is not because more elaborate diagnostic techniques are used, or that salaries are higher, but because the outpatient attendances are lower. Of the London teaching hospitals, St. George's Hospital has the highest inpatient cost, $109.50 per week, compared with $80.20 for the average London hospital, and $94 for the London teaching hospital.

Institute of Orthopedics.—A new research block for the Institute of Orthopedics was opened at Stanmore, where the rural branch of the National Orthopedic Hospital is situated. The opening ceremony

was performed by Sir Henry Dale, of the Wellcome Trust, which contributed $120,000 toward the building. The institute was established in 1946 in the Royal National Orthopedic Hospital in London, where it occupied one of the floors. A metabolic unit was added in 1951, and a department of biochemistry in 1952. Laboratories for pathology and clinical research and an orthopedic museum were subsequently incorporated. The opening of the new block at Stanmore completed the institute's building program. The department of biochemistry is headed by Dr. P. Walker, who is examining enzymes associated with the breakdown of hyaluronic acid and chondroitin sulfate. Dr. C. Lack, who directs the division of clinical pathology and bacteriology, is studying plasminogen, the preparation and properties of staphylokinase, serologic tests for staphylococcic infection, and the mechanism whereby cartilage is destroyed in suppurative arthritis. Dr. Angus McPherson is studying viscerosomatic spinal reflexes; Dr. Hubert Sissons is studying bone disorders and muscle atrophy; and Dr. John Scales is examining the fate of metallic implants in the body, the design of prostheses, and the applications of plastics in orthopedics.

Control of Pain.—Although phenol achieved notoriety in a recent court case as a cause of damage to the spinal cord, Brown claims that if it is dissolved in anhydrous glycerol, or in the contrast agent iophendylate, and injected intraspinally, it relieves intractable pain due to spinal cord irritation without causing any apparent harm (*Lancet* 2:975, 1958). He injected intraspinally 2 ml. of a 5% solution of phenol in one of the solvents at the level of the roots carrying pain from a malignant lesion. By accurate positioning of the patient the hyperbaric phenol solution was concentrated at the chosen level and kept there for about 30 minutes. In the lumbar and sacral regions injection and positioning were relatively easy, but in the midthoracic and cervical regions fluoroscopy was required. Treatments were given every two days. Pain was relieved within 20 minutes by this procedure. Sensation of touch, pinprick, vibration, proprioception, temperature, and tendon and muscle pain were unimpaired. Immediately after the injection a sensation of coldness was followed by analgesia and weakness of the affected limb, which lasted for about 20 minutes, then motor power and sensation gradually recovered over the next 24 hours. Superficial and deep reflexes vanished and did not return. While resting muscle tone was permanently greatly reduced, voluntary motor power was unaffected.

Fifty-five patients with severe intractable pain were treated by this method. Of 38 with pain due to cancer, 30 were relieved, but in only 5 of 17 patients with pain of nonmalignant origin was analgesia obtained. Although no local reaction to the injected phenol was seen at the autopsy of some of the cancer patients, four had a well-marked arachnoiditis when the spinal cord was exposed two to four weeks after treatment. So far, however, no patient has shown any clinical evidence of adhesive or obliterative arachnoiditis. The site of the action of the phenol appeared to be the posterior-root ganglion or the region of the proximal neuroganglionic junction. The patients have been under observation for periods up to 21 months. A much longer follow-up period is required to exclude the possibility of serious delayed neurological complications, which may take months, or even years, to develop, and once established cannot be reversed. For this reason Brown suggested that for the time being intraspinally administered phenol should be used mainly for treating the pain of malignant disease.

Mass Radiography.—The Corporation of Glasgow published the results of its mass radiography campaign, during which 714,915 people or 76% of the town's population were x-rayed. In five weeks 2,755 cases of active pulmonary tuberculosis or 3.8 per 1,000 in those examined were detected. A further 5,379 cases of tuberculosis of doubtful activity were brought to light. The detection rate was greater in men than in women (4.8 to 2.8 per 1,000), due to the high incidence of the disease in older men. In the last 20 years tuberculosis has been diagnosed mainly in the young adult and has largely escaped detection in middle-aged and elderly persons. It is remarkable that such a large number of people were x-rayed. The success was attributed to good publicity and a short but intensive campaign, which was directed by a special committee, including newspaper and cinema men and representatives of the BBC. A million pieces of publicity material, including 100,000 posters, were issued. Every bus and streetcar and nearly every shop carried a poster. Competitions were organized and prizes offered, although the serious side, with a full explanation of the campaign, was not neglected. Press, radio, and cinema were used to impress on the people of Glasgow the importance of the project. It was thought that if more units had been available over 80% of the population would have been x-rayed. Among the 6,576 contracts x-rayed after the campaign only 17 new cases of tuberculosis were found. The total cost of the scheme was $320,000 or 44 cents per person examined. The cost of detecting a new and active case of tuberculosis was about $125. Publicity cost $47,600 or 6.7 cents per film. The organizers believed that the cost of the campaign was well justified.

CORRESPONDENCE

POSTMORTEM DIAGNOSIS OF INSULIN SHOCK

To the Editor:—In the article by Birkinshaw and co-workers (Investigations in a Case of Murder by Insulin Poisoning, *Brit. M. J.* **2**:463-468 [Aug. 23] 1958) discussed in the Foreign Letters section of THE JOURNAL (**168**:811 [Oct. 11] 1958) detection, identification, and quantitation of insulin were ingeniously achieved in tissue extracts from sites of needle marks in the victim's buttocks. However, in spite of large amounts of insulin in the body of the victim, paradoxically, not hypoglycemia but a hyperglycemia of 210 mg. per 100 ml. was demonstrated about six hours after death. Postmortem chemistry, so far, has been applied mainly as aid in autopsy diagnosis of diabetes mellitus (Hamilton-Patterson and Johnson, *J. Path. & Bact.* **50**:473-482 [May] 1940; Tonge and Wannan, *M. J. Australia* **1**:439-447 [April 2] 1949; and Naumann, *Am. J. Clin. Path.* **20**:314-324 [April] 1950) but rarely of insulin shock. Proof of antemortem insulin effect by postmortem glucose values is difficult, since glycolysis soon after death lowers glucose concentrations except in the inferior vena cava and right heart blood, where it may greatly increase by diffusion of glucose liberated through glycogenolysis in the liver. Postmortem glycolysis, but less marked and erratic, is present also in the cerebrospinal fluid, which is subject neither to interference by clotting nor to that by non-sugar-reducing substances. The decrease of cerebrospinal fluid glucose (see table) shows the main drop in concentration after the first hour post mortem and irregular rise between the 3rd and 10th hour.

Postmortem Cerebrospinal Fluid Glucose Level, Determined by the Folin-Wu Method, One to Ten Hours After Death

Hours Post Mortem	Cases, No.	Levels, Mg. /100 Ml. Average	Range
1	11	90	63-134
2	9	55	30-80
3	15	49	23-84
6	5	58	42-76
10	6	29	14-35

Based on several articles (Naumann, *Arch. Path.* **47**:70-77 [Jan.] 1949; *Am. J. Clin. Path.* **26**:495-505 [May] 1956; Queries and Minor Notes, *J. A. M. A.* **157**:780 [Feb. 26] 1955; *Proc. Soc. Exper. Biol. & Med.* **98**:16-18, 1958), a presentation of conditions and criteria for the postmortem diagnosis of insulin shock may be made as follows: 1. Only cerebrospinal fluid, except in patients with meningitis, and not blood should be used for postmortem glucose level determinations, especially when an insulin reaction is suspected for reasons given above. 2. Glucose values found must be low enough—50% or less of lower ranges observed after death (see table)—and analytical errors small enough by duplicate determinations of concentrated solutions to prevent misinterpretation due to chance variation. 3. Cerebrospinal fluid glucose levels of 30 ± 0.5 mg. per 100 ml. or less in the third hour may be considered presumptive evidence of insulin shock, provided specimens are analyzed promptly. 4. Values of specimens taken later than three hours after death are difficult to interpret but if low enough may be considered confirmatory evidence of insulin shock.

In the case of Birkinshaw and co-workers the specimen of "mixed heart blood" presumably contained right heart blood with high glucose level due to diffusion of glucose derived from liver glycogen. Although conclusive evidence of insulin effect could not have been secured six hours after death, a low cerebrospinal fluid glucose value, nevertheless, may have served as corroborative evidence. In one of my own cases of death due to accidental overdose of insulin, the cerebrospinal fluid glucose level was found to be 19 mg. per 100 ml. three hours after death, a result consistent with a postmortem diagnosis of insulin shock.

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ASSOCIATION OF CHOLELITHIASIS, HIATUS HERNIA, AND DIVERTICULOSIS COLI

To the Editor:—In THE JOURNAL (**168**:257-261 [Sept. 20] 1958) Foster and Knutson gave some interesting data regarding the frequency of occurrence of the association of cholelithiasis, hiatus hernia, and diverticulosis coli in a hospital population. This frequency was found to be far greater than that calculated as due to random coincidence. In this calculation, however, there seem to be some possible errors which could partly or wholly account for the results of the study.

First, there is a possibility of error due to differences in probability of admission to hospital for patients with the triad and patients with the single conditions. We believe it to be generally agreed that the three single conditions under study may occur without giving rise to symptoms. This implies that some patients with one or more components of the triad are not referred to hospital. Even when ideal conditions exist and all patients with symptoms of at least one of the components seek medical advice and are referred to hospital, those without symptoms will stay behind. This also implies that occurrence of two or three components of the triad in the same patient could give this patient an increased probability of admission to hospital, simply because of the increased probability of symptoms. It also seems to be generally agreed that the three components can give rise to similar symptoms. Therefore hospital admission of patients with symptomless components in association with one or two other components with symptoms will imply a high probability that also the symptomless component is detected. This will certainly be the case when doctors start assuming an etiological association between the components of the triad and when finding one of the components make the necessary radiologic examinations to detect the other components. Therefore, even if no association exists between the components of the triad, the frequency of occurrence of the triad in a hospital population is likely to be greater than random coincidence as calculated by multiplication of the frequencies of the single diseases in the hospital population. This will be the case even under the ideal conditions mentioned before (Berkson, *J. Biometrics Bull.* 2:47, 1946).

Second, there is a possibility of error due to selection of the patients subjected to the different radiologic examinations. When only the hospital population under investigation (the 2,020 patients studied) is considered, the calculation of the P values of the different diseases is hard to understand. The method of estimating the P values, applied by Foster and Knutson, is valid only under the assumption that the choice between the three radiologic examinations has been made strictly at random. The article does not give the impression that this has been the case. The question arises as to why 713 patients were subjected to all three radiologic examinations. Possibly the answer to this question is that various symptoms motivated more extensive radiologic examination. If that is so, it may be less surprising to find a high incidence of double and triple associations among patients so selected.

Third, there is a possibility of error due to age differences in the incidence of the three diseases. As the incidence of the three components is known to rise with increasing age, the high incidence of the triad might be partly due to this. The fact that the mean age of the patients with the triad was found to be higher than the mean ages of the patients with one of the components is in accordance with this assumption. Such association, however, lacks biological significance.

The study of Foster and Knutson has the merit that it draws attention to the difficulties facing the surgeon when trying to evaluate the proper therapy in each single case of a double or triple association. It is a pity, however, that the authors have not investigated their material from the selection point of view. Their view on possible etiological factors in the association of the three diseases is very valuable. It seems, however, that the association of the three components of the triad cannot be proved on the basis of the statistical data presented.

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To the Editor:—I am pleased that doctors van der Linden and Taube have critically analyzed our figures and believe that their statements are well worth publishing. Our study was not primarily oriented to statistics but designed rather to alert clinicians as to the frequency of the triple association. To further amplify our viewpoint, I shall comment on the salient points raised in the critique.

A series of cases studied by x-ray could not readily be obtained outside a clinic or hospital population. The approximate 15% asymptomatic patients with the triad would not heavily weight a non-hospital population in favor of chance. The incidence of the respective single conditions in our series is not significantly greater than those of any other report. Hence, the probability value obtained by multiplication of the percentages should be acceptable. The 713 patients having all three roentgenographic studies happened to fall in this category on the basis of the usual indications as determined by several examiners. This was not a study to find the triad cases but largely a retrospective calculation.

We would be happy if others would attempt to test our conclusions. It would be interesting to see the results of an ideal statistical study.

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FREEDOM FOR THE PROFESSIONS

To the Editor:—On June 14, 1958, Rear Adm. H. G. Rickover gave an address to the graduating class of the Stevens Institute of Technology in which he paid some very handsome compliments to the professional principles under which the American Medical Association operates. In particular, he noted the advantages of a fee for service, in preference to salary, in compensation of professional personnel. He pointed out that this is one of the strong methods of resisting the lay control of professional acts by administrators. In general, he is advising those who would make a full-fledged profession of engineering to follow the medical example.

Some weeks ago the *Manchester Guardian* called attention to the fact that physicians were leaving East Germany in large numbers, because the East German government had denied their children the right to be admitted to the universities, since they were not members of the working classes. In the issue of Sept. 25, 1958, it appears that the East German government has backed down in the face of a great shortage of physicians. They now offer to give the children of physicians rights equal to those of workers and farmers in obtaining entrance to the universities and technical colleges.

It was also noted that physicians will be allowed to carry on their independent practices, and there will be no compulsion to work on state panels. Physicians will now be allowed to travel freely in West Germany to attend congresses and meetings. They will be allowed to practice their profession, irrespective of whether they bind themselves to follow the precepts of dialectical materialism. This is an example of the strength of a strong professional organization.

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TORT LIABILITY OF CHARITABLE HOSPITALS TO PATIENTS

To the Editor:—Although the review on "Tort Liability of Charitable Hospitals to Patients" in The Journal (**168:**788-789 [Oct. 11] 1958) provides a valuable survey of the law in the several states, it may be prudent to bring attention to an inaccuracy which appears in the state-by-state schedule appended to the digest. New Jersey is there represented as a jurisdiction which supports "full liability." For authority, the collator cites *Collopy v. Newark Eye & Ear Infirmary,* 141 A. (2d.) 276 (1958).

The Collopy case was decided April 28, 1958, and it is true that the Supreme Court of New Jersey there rejected the former New Jersey rule, which for 33 years had denied recovery to patients damaged through the negligence of the agents of a charitable hospital. Three months later, however, July 22, 1958, the governor of New Jersey signed into law an act of the legislature which restored, in part, the earlier New Jersey judicial rule of charitable immunity, providing as follows:

> 1. No nonprofit corporation, society or association organized exclusively for religious, charitable, educational or hospital purposes shall, except as is hereinafter set forth, be liable to respond in damages to any person who shall suffer damage from the negligence of any agent or servant of such corporation, society or association, where such person is a beneficiary . . . of such nonprofit corporation, society, or corporation; . . . *Chapter 131, P.L. 1958.*

The mentioned exception permits recovery against "any nonprofit corporation, society or association organized exclusively for hospital purposes . . . to an amount not exceeding $10,000.00 . . ." By express language, the statute expires June 30, 1959. "Full liability" of charitable hospitals in New Jersey for the negligence of agents is not, then, the current law. Although liability does clearly exist, no recovery can exceed $10,000.

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THE FAMILY DOCTOR

To the Editor:—In the correspondence section of The Journal, Dec. 6, 1958, page 1929, an interesting letter by Dr. Leo J. DeBacker appears in reference to an article by Dr. Wheatley. Both doctors suggested remedies for the deplorable situation of boredom in which some pediatricians seem to find themselves. It is remarkable to me that an obvious solution has not occurred to either author. It seems self-evident that our medical school faculties should orient themselves more strongly to inducing young men to go into the field of general practice rather than glamorizing the specialties. Rather than the pediatrician being the family doctor of the future, I believe that the family doctor is the qualified man in the present and the future. If any young medical student will switch his interest from pediatrics to general practice, I can guarantee he may get tired, but never bored.

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MEDICAL LITERATURE ABSTRACTS

INTERNAL MEDICINE

Acute Myocardial Ischaemia: Significance of Plasma-Transaminase Activity. A. J. Goble and E. N. O'Brien. Lancet **2**:873-877 (Oct. 25) 1958 [London].

The authors performed serial estimations of glutamic oxalacetic transaminase activity of plasma (P. G. O. T.) with the aid of a modification of Karmen's spectrophotometric method in 25 normal persons and in 20 patients with a history of angina pectoris or previous myocardial infarction who were at rest and free from pain in the cardiac department of the Royal Melbourne Hospital in Melbourne, Australia. Serial estimations of P. G. O. T. activity also were carried out in the same hospital in 18 patients with severe attacks of cardiac pain unassociated with clinical and electrocardiographic evidence of recent myocardial infarction. In the 25 normal persons and in the 20 patients with known ischemic heart disease who were resting and free from pain, the individual maximum range of serial P. G. O. T. levels was 10 units or less with one exception. Rises of P. G. O. T. levels beyond an individual highest-to-lowest range limit of 15 units were therefore regarded as abnormal, and between 10 and 15 units as probably abnormal. Of the 18 patients with severe attacks of typical cardiac pain, 10 had isolated attacks of pain and 8 had repeated attacks of pain extending over more than 2 weeks; 4 of the 10 patients and all the 8 patients had increased P. G. O. T. levels. A single rise in P. G. O. T. activity occurred in the 4 patients, and irregular or repeated rises in P. G. O. T. levels were observed in the 8 patients. The patterns of P. G. O. T. activity thus indicated single episodes of necrosis in some patients with isolated attacks of pain and similar but repeated episodes in those with attacks of pain recurring for weeks. There was a subsequent rise in the erythrocyte sedimentation rate in 11 of these 12 patients. In none of the 18 patients did the temperature rise, or leukocytosis, persistent fall in blood pressure, or cardiac failure occur. The electrocardiograms obtained from these patients revealed depression of the S-T segments or inversion of T waves, whether necrosis was demonstrable or not. The severity and duration of pain, associated dyspnea, sweating, and temporary fall in blood pressure, and electrocardiography proved to be unreliable guides to necrosis associated with severe myocardial ischemia.

Plasma-glutamic-oxalacetic-transaminase activity is a sensitive index of myocardial necrosis. A new descriptive terminology is both possible and necessary, recognizing that cardiac pain, irrespective of its duration or severity, indicates myocardial ischemia, that rises of erythrocyte sedimentation rate and P. G. O. T. levels indicate myocardial necrosis, and that electrocardiographic changes indicate the localization of the myocardial ischemia or necrosis. It should also be recognized that repeated small attacks of myocardial necrosis may summate to produce the electrocardiographic pattern of transmural myocardial infarction.

Successful Treatment of Quinidine and Procaine Amide Intoxication: Report of Three Cases. F. Wasserman, L. Brodsky, M. M. Dick and others. New England J. Med. **259**:797-802 (Oct. 23) 1958 [Boston].

Studies made by the authors in laboratory animals had demonstrated the efficacy of molar sodium lactate in reversing toxic electrocardiographic and blood pressure changes resulting from quinidine and procainamide. They report on 3 patients whose histories illustrate the successful clinical application of their observations on animals. Toxic effects from quinidine and procainamide are relatively uncommon, but they may result from increased sensitivity to the drugs or from overdosage. The electrocardiographic changes of quinidine and procainamide intoxication consist of sinoatrial slowing, followed by sinus pauses, sinus arrhythmias, progressive QRS widening, prolongation of the P-R and Q-T intervals, RS-T-segment depression and T-wave changes; in addition defects of interatrial conduction, leading to partial or complete interatrial block, have been observed. A late manifestation consists of an atrioventricular nodal rhythm that terminates in either ventricular fibrillation or ventricular standstill. More commonly recognized clinical signs and symptoms of intoxication with quinidine or procainamide are nausea, vomiting, diarrhea, vertigo, tinnitus, and hypotension. Attempts have been made to correlate plasma quini-

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dine levels with therapeutic effects and toxic manifestations. The presence of congestive heart failure and renal impairment appears to increase the likelihood of cardiotoxicity from quinidine at lower plasma concentrations.

The first of the 3 patients, who had a plasma quinidine level of 5.1 mg. per liter, became hypotensive, and sinus bradycardia developed. The second patient with congestive heart failure, acidosis, and azotemia secondary to renal insufficiency showed severe electrocardiographic and clinical signs of quinidine intoxication with a plasma quinidine level of 6.3 mg. per liter. The observation of others that sodium lactate administration abruptly decreases the plasma quinidine concentration may explain in part the dramatic improvement observed in this patient. The authors believe that acidosis was probably a factor in producing the shock-like state observed in the second patient. They were unable to obtain determinations of the blood pH in case 1. The intravenous administration of molar sodium lactate helped restore the blood pressure in both patients. The third patient with diabetic acidosis and impaired renal function, went into a shock-like state with markedly widened QRS complexes after the administrations of 600 mg. of procainamide intravenously in 6 minutes. The intravenous administration of molar sodium lactate promptly speeded up the slow rhythm and narrowed the widened QRS complexes.

The combination of molar sodium lactate and a sympathomimetic drug has been shown to increase the blood pressure to levels greater than might be expected with either agent alone. Experimental studies suggest that a priming dose of intravenously administered molar sodium lactate increases the tolerance to both quinidine and procainamide given by vein. Preliminary clinical observations suggest that molar sodium lactate may reverse the toxic electrocardiographic manifestations and the hypotension from both drugs without significantly changing the therapeutic efficacy.

Adult Chronic Bronchitis—Continuous Antibiotic Therapy. G. Edwards and E. C. Fear. Brit. M. J. 2:1010-1012 (Oct. 25) 1958 [London].

The authors report the results of an 18-month follow-up study of 42 patients with chronic bronchitis, 29 of whom were treated with oxytetracycline and 13 were treated with a sulfonamide preparation and autogenous Hemophilus influenzae vaccine. Continuous and prolonged treatment with oxytetracycline for one year or more not only prevented relapse in patients with chronic bronchitis but increased the rate of improvement the longer the therapy was maintained. The relapse rate in the group of patients not receiving oxytetracycline was considerably greater than in those treated with this antibiotic; less patients in the group not receiving oxytetracycline were improved and some became worse. Acute exacerbations of chronic bronchitis assume major proportions during the fall and winter, particularly between September and February, when 80% of the relapses tend to occur. It is suggested that continuous therapy with oxytetracycline for one period of about six months in each year, to include the period of maximum relapse, may prevent exacerbations and maintain most patients with bronchitis in effective and useful employment.

Asiatic Influenza in a Midwestern Town: With a Comparison of Intradermal and Subcutaneous Vaccination. L. J. Kirkham. J. Iowa M. Soc. 48:593-598 (Nov.) 1958 [Des Moines].

In order to investigate the relative effectiveness of intradermally and subcutaneously injected influenza vaccine the author studied the over-all incidence of influenza in the town of Mason City, Iowa, during the epidemic of November, 1957. Ninety-three (44.1%) of 211 persons selected at random who had not received influenza vaccine contracted influenza during the epidemic. Two hundred fifty questionnaires regarding the 2 techniques of vaccination were sent out to selected persons who had medical reasons for avoiding influenza and who had consequently been vaccinated. One hundred ninety-eight usable replies were received. Of these 74 had been given 0.1 cc. (20 CCA [chicken cell agglutination] units) intradermally, and 37 had been given 0.1-cc. intradermal injections with a week's interval between them. Thirty-one persons had been given 1.0 cc. (200 CCA units) subcutaneously and 54 had been given 0.1-cc. intradermal injections and an additional 0.9 cc. subcutaneously because no reaction had occurred after intradermal injections.

There was no significant difference in the protection afforded these persons. About 10% of all vaccinated individuals contracted influenza regardless of the size of the dose and the method used in administration. The incidence of influenza of about 45% in the general population compared to 10% incidence of influenza in the vaccinated population indicates that the vaccine protected about 3 out of 4 individuals. Thus the vaccination was effective in about 75% of all vaccinated persons. There was no significant difference in number of days of disability between the groups who had received intradermal injections and the general population group. The illness may have been somewhat less severe and seemed to decrease the number of days of disability in those who had received the subcutaneous injections of the vaccine in a 200-CCA dose, but the number of cases was too small and the method of sampling too inaccurate to support a definite conclusion. The disease had a decidedly adverse effect on life expectancy in those persons who were past the age of 60 years. It is therefore suggested that physicians immunize such patients as rapidly as

possible, since the occurrence of this particular strain of type A influenza virus is to be expected throughout the next 10 years.

Influenza Encephalitis. S.-I. Oftedal. Tidsskr. norske lægefor. **78**:996-998 (Oct. 15) 1958 (In Norwegian) [Oslo].

In Vestfold Central Hospital a number of milder complications from the central nervous system were seen in connection with Asian influenza. The history of the disease was typical—sudden high temperature, slight catarrhal symptoms, pain in muscles and joints, and general indisposition. Several cases occurred simultaneously. The 4 cases where antibodies against the influenza virus of Asian type were demonstrated in the serum are reported in detail. The complications appeared from a couple of days to 2 weeks after the onset of Asian influenza. The psychic complications all presented the same pattern but in different degree. There were symptoms of somnolence, disturbance in consciousness, paranoid delusions and hallucinations, not, however, the insomnia and restlessness at night described in lethargic encephalitis. The psychic phenomena lasted for from 1 week to 6 or 7 weeks. The electrocardiographic changes were fairly parallel with the clinical symptoms, but usually continued somewhat longer. The slight increase in cell count and albumin found in the 2 patients in whom the spinal fluid was examined in the acute phase disappeared on regression of the clinical symptoms. The cases of encephalitis were comparatively light, with complete recovery. The psychic symptoms seemed most marked in the patients who before the start of the illness had shown signs of psychic disturbance.

Role of Hemolysis in Anemia Secondary to Chronic Lymphocytic Leukemia and Certain Malignant Lymphomas. J. G. Freymann, S. B. Burrell and E. A. Marler. New England J. Med. **259**:847-855 (Oct. 30) 1958 [Boston].

The authors studied the hemolytic rates and erythropoiesis in 8 men and 9 women between the ages of 33 and 77 years, with chronic lymphocytic leukemia or malignant lymphoma of the lymphocytic or follicular types. All but 1 had negative reactions of the blood to the Coombs' test. There was minimal or no shortening of the erythrocyte life span, as determined by radioactive sodium chromate (Cr^{51}) tagging, in 9 of 10 patients whose hemoglobin levels did not fall below 7.5 Gm. per 100 cc. There was a linear decrease in erythrocyte life span as the anemia increased in severity (below 7.5 Gm. per 100 cc. of hemoglobin). Splenic sequestration of tagged erythrocytes occurred in the latter group, but not in the patients with near normal biological half life of radioactive chromate ($T\frac{1}{2}$ Cr^{51}), even when splenomegaly was massive. There was no correlation between the size of the spleen and the degree of erythrocyte sequestration.

Reticulocytosis and bone marrow erythropoiesis were strikingly decreased in patients with negative Coombs' tests, even those with the most severe hemolysis. This was in contrast with 5 other patients (2 men and 3 women) with chronic lymphocytic leukemia whose age range corresponded with that of the 17 patients and who had similar degrees of anemia but had positive reactions to the Coombs test. These 5 patients had marked evidence of healthy bone-marrow response. Thus, the equal degrees of anemia found in the 2 groups of patients had probably been reached by different means. In the group with positive Coombs' tests a highly active erythropoietic system was unable to keep up with even more active hemolysis. In the group with negative tests there was slower hemolysis but little, if any, ability on the part of the marrow to compensate for it. It is believed that inadequate erythropoiesis was a major cause of anemia in all the patients with negative Coombs' tests and that occult hemolysis became of importance only as the hemoglobin level fell progressively below 8 Gm. per 100 cc. Most of the patients had received roentgenotherapy to the spleen or treatment with alkylating agents before their hematological states were studied. Alkylating agents, particularly chlorambucil [p-(di-2-chloroethyl) aminophenylbutyric acid] apparently precipitated sudden hemolysis in some patients who, although anemic, had been relatively stable before therapy.

Paroxysmal Nocturnal Hemoglobinuria: A Case Report with a Negative Ham Presumptive Test Associated with Serum Properdin Deficiency. R. K. Blaisdell, R. E. Priest and E. Beutler. Blood **13**: 1074-1084 (Nov.) 1958 [New York].

The authors report on a 51-year-old Negro woman who for years had had periodic weakness and vague abdominal discomfort. She admitted passing dark urine occasionally but this did not seem to bear any relationship to the attacks of weakness, to abdominal pain or to sleep. The weakness progressed in severity with dyspnea on exertion, palpitation, and swelling of the ankles. Ham's presumptive test for paroxysmal nocturnal hemoglobinuria was performed with negative result, accounting for the failure to make the correct diagnosis initially. With the discovery of hemosiderinuria, Ham's complete acid hemolysis test was performed and gave atypical results in that there was no hemolysis when the patient's red blood cells were incubated with her serum, with or without acidification. The patient's acidified serum also was incapable to hemolyze the red blood cells from another patient with established paroxysmal nocturnal hemoglobinuria. Special studies of the patient's serum revealed a deficiency of properdin, while magnesium and complement did not appear to be lacking. It is suggested that the false-negative presumptive test for paroxysmal nocturnal hemo-

globinuria and the atypical results of the complete acid hemolysis test for this condition are due to a loss of the in vitro hemolytic activity of the serum associated with a deficiency of properdin.

Additional tests showed that there was acidosis associated with renal insufficiency. This acidosis did not appear to accelerate the hemolyti process, for there was no apparent reduction of hemolytic activity in vivo when the acidosis was corrected by the administration of sodium bicarbonate. There was a progressive decline in circulating hemoglobin to 5.2 Gm. per 100 cc. and the alkalization program, therefore, was abandoned after 67 days. The patient was given transfusions, initially of whole blood and subsequently of washed blood cells. With each rise in circulating hemoglobin there was amelioration of symptoms, but these periods of improvement were brief. Acute, severe abdominal pain with distention supervened. Despite the transfusions with washed blood cells, antimicrobial drug therapy, and digitalization, the patient died. Autopsy revealed an acute generalized fibrinopurulent peritonitis as the proximate cause of death; the pathogenesis of this peritonitis was not apparent. Other findings suggested that the protracted deposition of massive quantities of iron in the kidney may play a role in the not uncommon occurrence of renal disease in patients with paroxysmal nocturnal hemoglobinuria.

Idiopathic Hypercalcuria. P. H. Henneman, P. H. Benedict, A. P. Forbes and H. R. Dudley. New England J. Med. **259**:802-807 (Oct. 23) 1958 [Boston].

There are many causes of hypercalcuria: hyperparathyroidism; osteoporosis, while the disease is progressing; Cushing's syndrome and high-dosage ACTH and corticoid therapy; high intake of calcium and administration of vitamin D; sarcoidosis and beryllium poisoning; osteomalacia of renal origin, such as renal tubular acidosis; hyperthyroidism; metastatic cancer; multiple myeloma; and so forth. In this paper a condition is described in which the cause of the hypercalcuria is not clear—hence, the term "idiopathic hypercalcuria." This syndrome, which is illustrated by 35 male patients, is characterized by a normal serum calcium level, a low serum phosphorus level, and an increased urinary calcium excretion. This dislocation of homeostasis has been brought to the attention of the authors in the kidney stone clinic because of associated kidney stones.

These 35 patients are compared with 14 patients with mild hyperparathyroidism. Both groups had equally elevated urinary calcium levels and equally depressed serum phosphorus levels; the group with idiopathic hypercalcuria had normal serum calcium levels whereas the hyperparathyroid group had hypercalcemia. The kidney stones formed in the group with idiopathic hypercalcuria were characteristically composed of calcium phosphate and calcium oxalate and without magnesium and ammonium phosphate; this composition suggests that the stones were formed while the patient was in a state of hypercalcuria without an abnormally alkaline urine. Balance studies demonstrate increased calcium absorption in 4 patients. Sodium phytate decreases the hypercalcuria in this syndrome and prevents stone growth and recurrence.

Epidemic Hemorrhagic Fever Attack Rates Among United Nations Troops During the Korean War. J. R. Paul and W. W. McClure. Am. J. Hyg. **68**:126-139 (Sept.) 1958 [Baltimore].

In spite of extensive investigations during the past 5 or 6 years, identification of the etiological agent of the type of hemorrhagic fever encountered among United Nations troops in Korea during the Korean war (1950-1953) and its mode of spread are still considered unfinished problems. One segment of the investigations has been concerned with the prevalence of this disease in various parts of Korea. Attempts were made to measure differential rates at which UN troops acquired hemorrhagic fever in different geographical areas during and just after the last 2 years of the Korean war and particularly during its last few months, i. e., the spring of 1953. The object of these studies was to relate high and low prevalence with local character of the terrain. In line with the suggestions made by others, the authors believe that the season exerts a considerable influence upon the epidemiology of the type of hemorrhagic fever encountered and that the terrain and local environment experienced by troops both during combat and the months immediately afterward also played a part. Under the conditions of the surveys, in which differential attack rates were measured, hemorrhagic fever seemed to flourish better in the spring and the autumn among military personnel who were living in tents or bunkers in the midst of rural or semiwild surroundings and overgrown fields, usually on abandoned farms, than among troops in areas which were mountainous and heavily forested. This does not necessarily imply that the etiological agent of hemorrhagic fever was limited to the special terrain but that conditions were such that they may have increased exposure within certain areas.

Folic Acid Deficiency and the Megaloblastic Anaemias. I. Chanarin and B. B. Anderson. Proc. Roy. Soc. Med. **51**:757-763 (Sept.) 1958 [London].

Megaloblastic anemia is the consequence of deficiency or interference with utilization of vitamin B_{12} or folic acid. The etiology of those megaloblastic anemias which respond completely to treatment with vitamin B_{12} is simple: They are due to

a deficiency of vitamin B_{12}, and this is almost invariably due to a failure of absorption of this factor, rarely to an inadequate dietary intake. The megaloblastic anemias which the authors discuss do not respond adequately to vitamin B_{12}, and folic acid is required in their treatment. A table lists idiopathic steatorrhea, pregnancy, anticonvulsant treatment of epilepsy, leukemia, cirrhosis, tropical sprue, nutritional megaloblastic anemia, and kwashiorkor as the conditions with which these megaloblastic anemias are associated. Megaloblastic anemia requiring folic acid treatment is far more common in tropical and semitrophical countries than in the temperate zone. The condition may be due to malabsorption, increased demand, impaired utilization, or reduced intake of folic acid and to such factors as an abnormal intestinal flora.

Methods are described which are concerned with the assessment of folic acid deficiency and with the measurement of folic acid absorption. These techniques are reviewed in relation to the various types of megaloblastic anemia. Impaired utilization may be due to folic acid antagonists, such as Aminopterin and Amethopterin, and also to the anticonvulsant drugs used in the treatment of epilepsy. Impaired utilization may also result from a primary vitamin B_{12} deficiency. The role of bacteria in producing megaloblastic anemia is uncertain. They may interfere with the absorption of folic acid, as in tropical sprue, and with the absorption of vitamin B_{12}, as in patients with anatomic lesions of the small intestine. Whether these bacteria can also produce substances which act as folic acid antagonists has not been demonstrated.

Hypogammaglobulinemia (Agammaglobulinemia) in a Ten-Year-Old Girl. W. H. Civin and D. H. Sandberg. Hawaii M. J. **18**:35-38 (Sept.-Oct.) 1958 [Honolulu].

A 10-year-old Japanese-Caucasian girl was repeatedly admitted to the hospital with bouts of infection. Three separate electrophoretic studies revealed no gamma globulins, and no cause for the absence of this serum globulin fraction could be elicited. The patient was treated with antibiotics, gamma globulin, and transfusions. Despite improvement, infections continued to occur, and the patient died during the 9th hospital admission in 6 years. Autopsy revealed numerous abscesses containing Proteus vulgaris, and there was one abscess in the cerebrum containing a branched acid-fast organism which either belonged to the Nocardia genus or was Mycobacterium tuberculosis.

Agammaglobulinemia has been reported with hypoproteinemia, lymphoma, and thymona. It has also been reported without apparent cause, in which case it may be either congenital or acquired. Gamma globulins are not synonymous with antibodies, and an elevated level of gamma globulins may be associated with absence of antibodies, as in multiple myeloma. Other mechanisms for combating infection occur in the absence of antibodies which migrate with the gamma globulin fraction. Laboratory methods of diagnosis of agammaglobulinemia deal with the determination of gamma globulins or of antibodies, and the two are not synonymous in the laboratory any more than they are identical in effect clinically. The case discussed is one of acquired agammaglobulinemia. Both its history and the discussion point up the defects in our knowledge concerning natural resistance to infection.

PUBLIC HEALTH

The Epidemiology of Psittacosis and Report of a Turkey-Borne Outbreak. R. D. Leachman and E. M. Yow. A. M. A. Arch. Int. Med. **102**:537-543 (Oct.) 1958 [Chicago].

On Aug. 28, 1956, about 2,500 turkeys were brought to Houston from a farm 11 miles north of Waller, Texas. The birds were processed by 2 poultry plants before Sept. 1. The week after delivery a febrile illness began to appear among workers in the 2 processing plants. Twenty of the 41 employees of plant A had symptoms indicative of psittacosis, and a rising titer of complement-fixing antibodies was found in 13. Most of these patients improved promptly after the institution of tetracycline therapy. One patient who did not seek medical aid until the symptoms had been present for a week died 5 days later, despite intensive antibiotic therapy. There was no psittacosis among the office workers, who had no direct contact with the turkeys. The group with the highest attack rate worked in the unloading and picking areas, where fluttering of wings stirred dust from the droppings and feathers. The patient who died was employed in this area; in addition, he was janitor for the plant and killed the birds. There were 40 employees in plant B. Although these persons were not studied as thoroughly as those in plant A, there were 11 with clinical symptoms of psittacosis and with positive complement-fixation tests.

Apparently some of the turkeys had not appeared normal at the time of shipping, and, when the flock was inspected, many of the remaining 1,500 birds in the older group had become sick and some had died. The pathological examination of the sick turkeys revealed evidence of ornithosis, and the virus causing this disease was isolated from them. Visable psittacosis virus was also found in the carcasses which had been sent to the Texas Department of Public Health laboratories. It was concluded that turkeys were the source of the human infection in the Houston poultry processing plants. Of the birds remaining at the farm, all were subsequently treated with tetracycline and were ultimately cleared of the infection. The history of the epidemiology of psittacosis is reviewed.

BOOK REVIEWS

Callander's Surgical Anatomy. By Barry J. Anson, M.A., Ph.D., Chairman, Department of Anatomy and Robert Laughlin Rea Professor, Northwestern University Medical School, Chicago, and Walter G. Maddock, M.S., M.D., F.A.C.S., Edward S. Elcock Professor of Surgery, Northwestern University Medical School. Fourth edition. Cloth. $21. Pp. 1157, with 1047 illustrations. W. B. Saunders Company, 218 W. Washington Sq., Philadelphia 5; 7 Grape St., Shaftesbury Ave., London, W. C. 2, England, 1958.

As stated in the preface to this new edition, this highly successful volume has been modified only to the extent of bringing up to date technical procedures in surgery and new knowledge in the field of anatomy. The format of the book is essentially the same as in the preceding editions, but it is about 100 pages longer and has about 100 more illustrations. The factual material continues to be accurate, and the form of presentation is useful not only from the point of view of reference to a particular detail but also to the field as a whole. This will probably remain a standard textbook for use in courses in surgical anatomy for medical students and will continue to be a useful reference for anatomic review for the surgical resident and the busy surgeon. It continues to correlate applied anatomy and surgery in a readable yet precise manner. The surgical aspect of the book concerns rationale rather than detailed technical description or instruction. Of particular value are the figures presenting anatomic variations in areas of importance to the surgeon. This feature alone would justify its inclusion in the surgeon's library. A number of the most recent developments in surgery have not been included. Some of the developments in vascular surgery, particularly, are perhaps too briefly mentioned. Except for its use as a textbook in courses in surgical anatomy, this volume must continue to serve as a supplement to more complete works on human anatomy.

The Management of Emergencies in Thoracic Surgery. By John Borrie, M.B.E., Ch.M., F.R.C.S., Thoracic Surgeon, Dunedin Hospital and Southern Metropolitan Region, Dunedin, New Zealand. Foreword by Sir Russell Brock. Cloth. $10. Pp. 340, with 300 illustrations. Appleton-Century-Crofts, Inc., 35 W. 32nd St., New York 1, 1958.

This is an excellent monograph on emergencies in thoracic surgery. As a reference book, it should be of service to specialists in thoracic surgery, but its chief appeal should be to the general practitioner and the general surgeon who are usually the first ones to be confronted with these emergencies. It is important that they be familiar with this field and that they be capable not only of recognizing the emergency but also of instituting the required treatment. This book should be in the emergency room of every hospital and in the library of every physician.

Handbook of Respiration. Analysis and compilation by Philip L. Altman, John F. Gibson, Jr., M.D., and Charles C. Wang. Edited by Dorothy S. Dittmer and Rudolph M. Grebe. Prepared under direction of Committee on Handbook of Biological Data, Division of Biology and Agriculture, National Academy of Sciences, National Research Council. Paper. $7.50. Pp. 403, with illustrations. W. B. Saunders Company, 218 W. Washington Sq., Philadelphia 5; 7 Grape St., Shaftesbury Ave., London, W. C. 2, England, 1958.

A stupendous amount of quantitative information about the mechanical and chemical aspects of respiration is made available by this remarkable volume. It is the sixth in a series of compilations of numerical data, mostly in tabular form, from various fields of biological science. Previous volumes have been devoted to hematology, nutrition and metabolism, toxicology, and general biological data. The data in the present volume are collected under 14 headings: basic physical and chemical data, basic respiratory anatomy, lung volumes and pulmonary function, blood respiratory characteristics, erythrocytes and respiratory pigments (including pyrrole pigments and cytochromes), mechanics of breathing, artificial respiration, effects of exercise, effects of inhaled gases, effects of ionizing radiations and other disturbing factors, oxygen consumption, tissue respiration in animals, and the same in plants. Since most of the data have meaning only in terms of the methods by which they were obtained, the bibliographic references are an essential feature of the book. Moreover, the problem of tabulating results obtained by different investigators under the most varied conditions can be solved only by securing the collaboration of reviewers who are able to criticize and assimilate the material. This work has been well done, and the book testifies to a magnificent spirit of cooperation among the editorial committee, the handbook staff, and the long list of contributors and reviewers. It should be represented in every library used by persons doing research in the medical sciences.

These book reviews have been prepared by competent authorities but do not represent the opinions of any medical or other organization unless specifically so stated.

QUESTIONS AND ANSWERS

RABIES IMMUNIZATION

To the Editor:—*A patient, bitten by a suspected rabid animal, received a 14-day course of rabies vaccine (duck embryo). How long does the immunity last from such vaccination? If the patient were bitten by another suspected rabid animal in the future, should he receive another 14-injection series or would fewer injections suffice, due to a "recall phenomenon"? Could the patient's serum be used as antiserum in treatment of another patient who required rabies antiserum therapy if the two bloods were compatible for ABO groups and Rh factor? If so, how much serum should be used?*

Jack E. Kaufmann, M.D., David City, Neb.

Answer.—The antibody response to a course of antirabies vaccine is measured by the neutralizing "power" of the recipient's serum when incubated with live rabies virus and later injected intracerebrally into susceptible mice. This has been done in a limited number of individuals on an experimental basis but is not a routine procedure. A recent article by Fox and co-workers (*Bull. World Health Organ.* **17**:869, 1957) summarizes their observations in this respect: "Study of recipients of Pasteur treatment indicated that antibody commonly persists for at least 5 years after a single course and for 15 or more years after re-treatment. It was also observed that the ability to respond to a booster of HEP Flury vaccine persists for at least 25 years. The response elicited by the booster is prompt and is usually at least equal to that resulting from a full primary course. The suggested conclusion is that previously treated persons need not receive more than a single booster on reexposure, and that Pasteur treatment provides a solid basis for long-sustained immunity." HEP Flury vaccine is an experimental avian embryo product somewhat similar to the duck embryo vaccine, and there is reason to believe that any potent antirabies vaccine would elicit a response very similar to the one observed by Fox and co-workers. Their results were derived from studies on 136 volunteers. It may be advisable to administer two booster doses instead of the single injection to previously treated persons if the exposure for which they are receiving treatment is severe. The use of serum from a person who has undergone treatment with antirabies vaccine for prophylaxis in another exposed person would pose the difficulty of testing the potency of the serum and consequently of estimating proper dosage. Commercial antirabies immune serum (horse origin) is administered in a dose of 0.25 ml. per pound of body weight, the potency of the product being standardized to contain at least 80 international units per milliliter. In order to arrive at an equivalent dosage, the human serum would have to be tested against the international standard. It could then be used much as the commercial product is.

EGG ALLERGY AND FERTILITY

To the Editor:—*Is there any evidence that an acute allergy to eggs on the part of the husband would be a cause for infertility? Could the sperm reaching the human egg be immobilized or destroyed? A husband reacted to a scratch test for egg allergy with the entire arm becoming swollen and red. He is able to detect minute quantities of egg used in cooking by a tingling of the tongue—which protects him from ingesting egg unknowingly in breads, pie crusts, coffee, and other foods. His allergies also include chicken, hen turkey (not rooster or tom turkey), fish, and honey. A complete examination for causes of infertility gave negative results throughout. It is realized that these allergies may be an indirect cause of the infertility because of the lack of certain food factors, but could this violent reaction to egg be a direct cause? Do sperm, as body cells, carry the allergic factors with them, or are these factors present in the spermal fluid? Have there been any cases in which a husband with a strong egg allergy has fathered children?*

J. G. White, M.D., Stamford, Conn.

Answer.—The genetic factors determining allergy are carried by the human sperm cell as well as by the ovum. In neither case does this factor determine a specific allergy but, rather, a tendency to develop sensitizations of any kind. The father or mother may be allergic to egg, while the offspring may develop allergy to ragweed pollen or wheat

The answers here published have been prepared by competent authorities. They do not, however, represent the opinions of any medical or other organization unless specifically so stated in the reply. Anonymous communications cannot be answered. Every letter must contain the writer's name and address, but these will be omitted on request.

or be entirely free of allergy. There is no evidence that acute allergy to egg, or, for that matter, allergy to any other food or inhalant, in the husband or wife is a cause of infertility. This consultant, in an experience of over 35 years, has seen many fathers and mothers with egg allergy. One speculative possibility can be considered: Experimentally, it has been possible to produce in animals an allergy to its own tissues, so that the tissue antibodies go on to damage and destroy an organ. One of the earliest demonstrations of this kind of autosensitization has been produced by Jules Freund and associates. A testicle removed from a guinea pig and a portion of the homogenized tissue reinjected in the same guinea pig produced degenerative changes in the remaining testicle with final aspermatogenesis. Autosensitization in man occurs in certain blood diseases and probably also in diseases of other organs, such as thyroid, kidney, heart, and nervous tissue. It is possible that infertility in the male may also be at times produced on this basis. This concept would entail a prior injury of the testicle (due to trauma, virus infection, drug, or other factors) followed by the production of testicular antibodies which produce final damage to the sperm-producing tissue. It can be speculated further that such an autosensitization process might be more likely to occur in persons who have other allergies. In the particular case cited, the finding of adequate and active spermatozoa would rule out such a possibility.

ANSWER.—A positive relationship between extremely violent food sensitivity and sterility has been noted by many observers. Though such instances are few, in almost all cases it was the wife who was allergic and in whom control of the allergy led to normal fertility. The British allergist, Dr. Vera Walker, has studied 16 such cases. It is doubtful that the spermatozoa of a human male sensitive to hen's egg would be immobilized or destroyed in the nonallergic environment into which they were placed, although they carry the genes of potential allergy. In reviewing case histories, this consultant could find no record of a married, egg-sensitive male who failed to have children. On the contrary, a number of patients extremely sensitive to common foods, including egg, have married and have brought their children and, subsequently, their grandchildren for studies concerned with food sensitivity. One sometimes wishes they were less fertile. If such allergy were a cause of infertility in only a small percentage of allergic patients, it would not be as difficult as it is to find subjects for studies linking the two states. Recent work in sterility implies that autoimmunity may be a factor (McMaster, *New York J. Med.* 58:2980, 1958).

RHEUMATIC FEVER AND HEARING LOSS

TO THE EDITOR:—*A 28-year-old woman, two months pregnant, has inactive rheumatic fever (last attack one year ago). Her husband has recovered from rheumatic fever. One of the children now has rheumatic fever, and a parent of the patient had rheumatic heart disease. Her second child, a girl, was born with nerve deafness (85% hearing loss). There is no history of syphilis or quinine therapy. Specifically, she wants to know the chances, possible causes, and prevention of hearing loss in the present fetus. Generally, is there any known etiological connection between rheumatic heart disease and hearing nerve involvement?* *Lester Lando, M.D., Monsey, N. Y.*

ANSWER.—As far as is known, there is no relationship whatsoever between rheumatic heart disease and nerve deafness in the offspring. Therefore, chances are excellent that the present pregnancy will not result in a nerve-deaf child. It is known that German measles in the first trimester of pregnancy, as well as the **Rh** blood factor, may produce nerve deafness in the offspring. Likewise, certain drugs, especially quinine, have been known to have a similar effect. It is also known that some children are born with nerve deafness without any apparent cause, other than its being of congenital origin.

LEUKOCYTOSIS

TO THE EDITOR:—*A 36-year-old woman, a laboratory technician, has repeatedly shown a white blood cell count of 14,000 to 15,000 per cubic millimeter. The usual differential is 84% segmented neutrophils, 5% band cells, 7% lymphocytes, 2% monocytes, and 2% eosinophils. During two past pregnancies her white blood cell count reached 18,000 to 25,000 per cubic millimeter. The platelet count was 289,000, reticulocytes 2.3%, hemoglobin level 11.4-12.0 Gm.%, hematocrit value 38%, and corrected sedimentation rate 11 mm. per hour. After each pregnancy, the white blood cell count receded to its basal level of 14,000 to 15,000 per cubic millimeter. No adenopathy or hepatosplenomegaly is apparent. Bone marrow examination has revealed nonspecific myeloid hyperplasia rather than any appearance of early chronic granulocytic leukemia. Please discuss the implications and prognosis of this case.*

Leonard Breslaw, M.D., Los Angeles.

ANSWER.—With the data presented, it would be impossible to make a categorical statement. One can do no more than speculate about the implications and the prognosis. The period of observation is not known, and it may only be assumed that it has been at least three years. The findings with exacerbation in pregnancy could well be wholly normal for this person, and the likelihood is that no

serious disease will be forthcoming. However, it is not specifically stated whether the patient has anything to do with x-ray equipment or radioactive substances which could have some bearing on the hematological abnormalities. Occasionally, leukocytosis may precede, as well as be associated with, polycythemia, thrombocytosis, or other myeloproliferative diseases which only the future could resolve.

ULTRASOUND AND HEADACHES

To the Editor:—*This problem concerns the evaluation of headaches and emotional irritability in a group of men working in a large aluminum plant. In one particular part of the plant, ultrasound is used to test for structural defects. A frequency of from 200 kilocycles to 25 megacycles is used. The operator of the ultrasound machine directs the passage of the transducer over the metallic member and detects any structural flaws by looking constantly at a cathode ray oscilloscope—for periods up to eight hours. The foreman and all the men under his jurisdiction have complained of chronic headaches and increased emotional irritability. They believe that the ultrasound has something to do with their symptoms. Although the men are not in direct line of the direction of the sound waves, they are required to clean the crystal covering the sound transducer and they work in an enclosure approximately 60 ft. long by 40 ft. wide. No authoritative reports have been seen which will help in determining whether the sound may be an etiological factor in producing the headaches and nervous irritability. Also, could peering at an oscilloscope screen for extended periods of time be a causative factor in the production of these headaches?*

Marvin B. Wolf, M.D., Adrian, Mich.

Answer.—This is a very interesting question. This consultant has had many similar inquiries regarding ultrasound, although the symptomatology allegedly due to ultrasound has been different in some of the cases. Present beliefs are that ultrasound will not have any untoward effect on hearing. Some difficulty has been found due to ultrasonic use as related to heat. This effect is on the local tissue, that is, through direct contact with the ultrasound by way of fluid mediums. In these cases, gloves seem to be enough protection to prevent any significant injury. The inquirer has put his finger on the problem by reference to the oscilloscope. It is true that watching a radar screen or an oscilloscope (which in effect is a radar screen) for long hours produces headaches and, as a result, nervous irritability. There is no evidence available that will support the claim that headaches and nervous irritability are due to exposure to ultrasound. Some other factor must be responsible.

ELECTROSHOCK THERAPY

To the Editor:—*A rare complication of electroshock treatment is said to be ventricular fibrillation. To what extent does succinylcholine, given intravenously in doses of 10 to 14 mg. before treatment, predispose to ventricular fibrillation? Does the use of atropine in doses of 0.6 to 1 mg. before electroshock therapy is done protect against cardiac side-effects? Are there any other methods of preventing them? What measures, medical and/or surgical, are indicated if ventricular fibrillation occurs after electroshock therapy? Does the rapidity of injection of succinylcholine have any bearing on the incidence of ventricular fibrillation?*

Edward L. Colman, M.D., Fergus Falls, Minn.

Answer.—Succinylcholine chloride is considered to be the safest drug employed to reduce muscular contractions that accompany convulsive seizures in electroshock therapy. Premedication with atropine, usually 1/75 grain (0.8 mg.) is advisable for its cardiac effect. It also diminishes salivation, nausea, and vomiting that at times may follow electroshock therapy. Preliminary sleep is usually induced by thiopental sodium given intravenously to relieve anxiety. Oxygen may be given at the time sleep is induced and should be administered, under pressure, during the brief state of apnea which results from the effect of succinylcholine. Oxygen administration should be continued until spontaneous respiration is restored. Administration of succinylcholine renders electroshock therapy safer, as far as the heart is concerned, as it diminishes considerably the rise in systolic pressure during the treatment. Recent coronary thrombosis and cardiac failure constitute contraindications to electroshock therapy. Transient cardiac arrhythmias are not uncommon in this treatment. There is no evidence that the administration of succinylcholine predisposes to ventricular fibrillation.

Answer.—It has never been demonstrated, either experimentally in animals or in man, that alternating current of the strength and duration used for electroshock therapy can produce, when applied to the brain, fibrillation of the ventricles of a normal heart. Succinylcholine, on the other hand, has no known pharmacological effects on the cardiac mechanism or, for that matter, on the entire cardiovascular system except for a slight elevation of the blood pressure during slow administration, attributable to sympathetic ganglionic stimulation. There is, therefore, no basis for the assumption that the combined effects of these two factors may precipitate ventricular fibrillation. Atropine may prevent occurrence of certain arrhythmias commonly seen in the "vagal phase" of convulsive therapy, viz., sinus bradycardia, slow ectopic rhythms, and

disorders of atrioventricular conduction. Proper management of circulatory arrest in the course of electroshock therapy depends, as in other such cardiac emergencies, on establishing as quickly as possible the type of abnormal mechanism, whether rapid ectopic impulse formation or cardiac standstill. Such a distinction is greatly aided by the monitoring of cardiac events on a cardioscope, which should be part of the routine equipment in any set-up for shock therapy. In this way, the critical four-minute period during which resuscitation is feasible can be utilized for immediate rational procedures (pounding of the chest, needling of the heart, intracardiac injection of a sympathomimetic drug, application of an external artificial pacemaker, or quick opening of the chest for rhythmic manual compression of the ventricles for intracoronary injection of appropriate drugs or for direct application of electric shocks).

PURITY OF DRINKING WATER

To the Editor:—*A water system in a Rocky Mountain area is constructed, essentially, in the following manner: A system of large and small collecting reservoirs, approximately 30 to 140 miles from a large city, feed over rapid, downhill streams into settling reservoirs which in turn feed into filter plants for the city drinking water supply. The present sanitation board, which claims the backing of the state health department, has maintained that the outlying collecting reservoirs, if used for recreation, i. e., boat fishing, would constitute a health hazard by reasons of drownings, illegal bathing, or other illegal human contact with the water. An opinion is desired as to the health aspects of the use of these outlying collecting basins (but not the settling basins) for fishing only in the face of the history of their use in other areas of the United States.*

M.D., Colorado.

Answer.—The purity of a city drinking water supply will depend on the degree of contamination of the outlying collecting reservoirs. Utilization of the areas around such reservoirs for recreation or fishing does represent a risk of contamination of the water. It is certainly true that fishing is allowed in the collecting reservoirs of many municipal areas. The question of fishing privileges is answered, in individual areas, after several factors are taken into consideration. Some of these factors involved are the purity of the water prior to the use of these areas for fishing, the amount of fishing allowed, the total volume of the reservoir and its turnover rate, and the efficiency of the water purification system. The use of such areas for fishing represents a health risk, but it may be extremely small.

INFECTIOUS MONONUCLEOSIS

To the Editor:—*Please comment on the allegation that a person with blood type A who has infectious mononucleosis would have a negative Paul-Bunnell reaction, i. e., that non-Forssman type of antibodies would not be demonstrated by the sheep red blood cells or differential reactions in the blood.*

N. R. Bouziane, M.D., Montreal, Canada.

Answer.—Persons of blood group A who have infectious mononucleosis have a positive Paul-Bunnell reaction, the same as persons of any other blood group. Also, the differential reactions for infectious mononucleosis are not influenced by the blood group of the patient. The statement in the query is not clear, unless it is meant that the Forssman type of antigen in red blood cells of group A would not permit the presence of Forssman type of sheep antiagglutinins in the serum. Actually, red blood cells of group A contain an antigen related to but not identical with Forssman's antigen. Furthermore, sheep red blood cells contain at least three different antigens: Forssman antigen, sheep species-specific antigen, and the specific infectious mononucleosis antigen.

PROGESTERONE FOR OVARIAN CYSTS

To the Editor:—*In regard to the answer of the consultant on the use of progesterone in the treatment of ovarian cysts, which appeared in* The Journal, *Nov. 1, 1958, page 1294, I think clarification is necessary. The consultant states, "If the etiology of the small painful cysts of the ovary is endometriosis, the administration of progesterone should aggravate, rather than improve, the condition." This statement should be amended to read "intermittent administration of progesterone," since, when progestins are given constantly and in increasing dosage for periods of five to seven months, amelioration of pain, amenorrhea, and regression in the size of ovarian enlargement have been noted in patients with proved endometriosis. I agree that the intermittent use of the progestins with subsequent bleeding from a secretory endometrium will result in increased dysmenorrhea.*

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